

IMPACT OF EUROPEAN SCIENCE AND TECHNOLOGY ON THE DEVELOPMENT OF MODERN ĀYURVEDA DURING 19TH CENTURY

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The western scientists of the nineteenth century were divided in respect of the utility of Āyurveda; some scholars were of the opinion that this old system of medicine is based on empiricism rather than science and no benefit can be derived from it, whereas there was a handful of dedicated workers who believed that Āyurveda was permeated with the scientific spirit as it is built by the rationale of observation and experiment and of induction and deduction. Further, this group opined that as this system of medicine has survived against the adversity of the time, therefore, it must have many useful things which can be unearthed particularly from its materia medica. The scholars of this thinking have done a great service to the Āyurveda, which will be more clear from the following paragraphs in which the impact of European science and culture on the development of Āyurveda of today will be discussed in the chronological order.

1. PUBLICATIONS OF ĀYURVEDIC TEXTS

Before the establishment of British rule, like the other books, Āyurvedic treatises were also hand written. This process was very time consuming and costly, and it could be afforded only by very rich people. This might be one of the reasons due to which Āyurveda could not stand parallel to the western medicine when it was introduced to India in the nineteenth century, though Āyurveda competed well with the Unani medicine in the medieval period. This was also one of the causes that instead of its glorious past it could not get proper place in the history of medicine.

To solve this problem, the printing of the important Āyurvedic texts started in the nineteenth century and during this period about 35 books were undertaken for printing. The number of their editions, reprints and translations etc. increased to more than 50 by the end of that century.

Suśruta Samhitā was the first Āyurvedic treatise, the publication of which was undertaken by the Government in the beginning of the fourth decade of the nineteenth century. But after the printing of its first volume and three-fourth of the second volume, it was discontinued describing it as an 'accumulation of waste papers' and only due

to the persuasion of the Asiatic society of Bengal, its publication was completed in 1835. Later on it was translated into Latin by Hessler in 1844. In about the same year, i.e. *Samvat-1900*, *Śārṅgadhara Saṃhitā* was published from Mirzapur with Hindi poem translation named as *Śārṅgadhara Sudhākara* (Sharma 1975). Later on *Bhāva Prakāśa* was also published with Hindi translation in 1855 from Bombay.

1861-1870 A.D.

Vaidyāmṛta was published with Marathi translation (4th edition) from Bombay in 1862, with Hindi translation from Varanasi in 1867 and with Simhali translation from Colombo in 1870. Meanwhile in 1867 *Nighaṅṭu Ratnākara* written by Vasudeva Godavale was published from Bombay.

The very important Āyurvedic treatise *Caraka Saṃhitā* was published in 1868 with the commentaries of Gaṅgādhara and Cakrapāṇi from Calcutta. In 1870 the English translation of two chapters of this book done by Mahendra Lal Sarkar was also published in the *Calcutta Journal of Medicine*. Other book published in this decade was *Āyurvedīya Paribhāṣā* in Bengali (1869) from Barahampur.

1871-1880

In this decade about 10 publications pertaining to classical Āyurveda came in the market. These include second print of *Bhāva Prakāśa* (Calcutta, 1875), *Suśruta Saṃhitā* (Calcutta, 1877) and *Caraka Saṃhitā* (Calcutta, 1877, Barahampur, 1877).

In this decade, very important Āyurvedic book on the diagnosis, i.e. *Mādhava Nidāna* (Calcutta, 1876) was also published. Other publications were *Vīramitrodaya* (Calcutta, 1875), *Āyurvedīya Dravyābhidhāna* (Calcutta, 1875), *Rasendra Cintāmaṇi* (Calcutta, 1878), *Rasa Ratnākara* (Calcutta, 1879) and *Vaidya Jivana* of Lolimba Raja (Varanasi, 1880) with Hindi translation.

1881-1890

By this time Madras also came forward for the publication of Āyurvedic classics and *Abhidhāna Ratnamālā* was published from this city in 1881. Next year saw the publication of the third important Āyurvedic text, i.e. *Aṣṭāṅga Hṛdaya*, which was published from Calcutta. Another book published in 1882 was *Kāla-Jñānam* from Varanasi. In 1883 U. C. Dutta completed the English translation of first 42 chapters of *Sūtra Sthāna* of *Suśruta Saṃhitā*, which was the first such attempt.

Vaṅga Sena, a reputed text of medieval period was printed first time in 1884 from Calcutta and in the same year second print of *Mādhava Nidāna* came out from Bombay. *Āyurveda Vijñāna* written by Vinoda Lal Sengupta in the nineteenth century was published from Calcutta; prior to this, it was published with Bengali translation.

Other important publications of this decade are *Hārīta Saṃhitā* (Calcutta, 1887),

Aṣṭāṅga Saṃgraha (Bombay, 1888), *Vīrasimḥavaloka* (Bombay, 1888) and *Yoga Ratnākara* (Pune, 1889).

1891-1900

In the last decade of the nineteenth century maximum Āyurvedic texts (more than 20) were published. The most commendable work of this decade was the publication of complete English translation of *Caraka Saṃhitā* done by Avinashachandra Kaviratna (Calcutta, 1891-99). In this decade two unsuccessful attempts were also made to translate *Suśruta Saṃhitā* in English by A. C. Chattopadhyaya (46 chapters of *Sūtra Sthāna*) in 1891 and then by Harnley (first 14 chapters of *Sūtra Sthāna*) in 1897. *Caraka Saṃhitā* was again printed in its original form from Calcutta in 1892, 1896 and 1897.

The three Āyurvedic books published in 1892 were *Śārṅgadhara Saṃhitā* with Bengali translation (Calcutta), *Nighaṅṭu Ratnākara* with Hindi translation (Lucknow) and *Rājvallabha Nighaṅṭu* with *Śāliḡrām* commentary (Bombay).

Bhaiṣajya Ratnāvalī, a reputed treatise on the Āyurvedic therapeutic written by Govinda Das in the eighteenth century and edited by Vinodalal Sengupta in the nineteenth century was published in 1893 from Calcutta. In the same year the first volume of *Āyurveda Darpaṇa*—dealing with the hygiene was published and its 5th volume was completed in 1898. *Gadankuśa* with Nepali translation (Varanasi) was published in 1893.

The two books published in 1894 were *Vṛnda Mādhava* from Pune and *Nūtana Amṛta Sāgara* from Bombay. The books published in the last 4 years of the 19th century include *Vaidyaka Sāra* (Bombay, 1896), *Siddha Mantra* (Bombay, 1898), *Muktāvalī* (Calcutta, 1897), *Rasaratnākara* (Varanasi, 1897), *Amṛta Sāgara* (Lucknow, 1899), *Cakradatta* (Calcutta) and *Āyurveda Saṃgraha* (Calcutta, 1900).

In this way in the nineteenth century Calcutta was the important learning centre of Āyurveda and it published about 24 books. The next number is of Bombay, with the publication of 10 Āyurvedic books. Third place goes to Varanasi which published 7 books in the nineteenth century. Other centre of Āyurvedic publications were Madras, Lucknow, Barahampur, Pune, Mirzapur and Colombo.

It is obvious from the foregoing that all the important Āyurvedic texts were published in the nineteenth century which paved the way for the Āyurvedic education on the modern lines.

2. PRESERVATION OF ĀYURVEDIC LITERATURE

By the time of establishment of British rule in India, the importance of manuscripts in the history of any science was well established and the European historian

and scientists with this background were very anxious to preserve the Āyurvedic literature in the form of manuscripts. This fact is clear from the observation of Wise (1845) that "the climate and material of which these ancient works are composed, render them very liable to be destroyed. Some are already lost and the difficulty in procuring correct copies of the remaining is yearly increasing".

In this direction the efforts of Asiatic Society of Bengal were commendable. The society in 1814 "resolved accordingly that the Asiatic Society determine upon forming a museum for the reception of all articles that may tend to illustrate oriental manners and history or to elucidate the peculiarities of art and nature in the East;" (Mukhopadhyaya, 1974). In the library of the society many manuscripts pertaining to Āyurveda were preserved in the 19th century.

A well-known Bower's Manuscript (*Nava-Nitaka*) was procured from the Turkistan in 1890 and Oxford University Library kept it in its safe custody after purchasing it from Col. Bower. Dr. Hoernle started its study in 1891 and his 21 years labour revealed many new facts. Similarly many other manuscripts were also procured and preserved on the scientific lines in the libraries and museums of abroad and India. The Kings of Indian States also took interest in this direction and Libraries of Nepal and Tanjore require special mention. During this time the catalogues were also prepared, for example, the Weber's *Catalogue of Berlin*, which eased the systemic study of the vast Āyurvedic manuscripts and later on their publication in the twentieth century.

3. DRUG RESEARCH

(a) Identification

At the time of Caraka, there were about 500 vegetable drugs in the Āyurvedic materia medica. Generally the students of Āyurveda lived with his Guru, who imparted them theoretical as well as practical training in connection with the identification and proper time of collection. Therefore, no elaborate descriptions regarding the identification of the medicinal plants were given. In the course of time more and more vegetable drugs were added to the materia medica and the problem was further complicated when the Āyurveda came into the close contact with the Arabian system of medicine and a great deal of intermingling of the drugs of both the system took place. Both the systems were using the same drug with the different name and similarly the different drugs with the same name were being used in the different areas. For instance, Mohomaten writers gave *kutaki* as an Indian synonym for black *Hellebore*, which misled most of the European workers (Dymock *et. al.*, 1890). Such chaos existed in the beginning of the nineteenth century.

To solve this problem very hard labour was put by the European botanists and by the end of the nineteenth century most of the Āyurvedic drugs were classified in classes and sub-classes on the scientific lines. In this direction the studies first began

in the early part of the nineteenth century and the authorities in the field like Sir William Jones Fleming (1810), Ainslie (1813, 1826), Mc Cosh (1837), Lindley (1838), Butter (1839), Dollard (1840) and Irvine (1841) require mention. But it was the hard work of Roxburgh (1820, 1824 and 1832), Wallich (1836), Royle (1839, 1840, 1845 and 1854) and Mouat and Macnamara and other ardent botanists, which helped in resolving the chaos of indigenous drugs and classified them on the scientific lines.

The later workers in the field are Birdwood (1868), Stawart (1869), Hooker (1872-79), Drury (1873), Waring (1877), Murray (1881) and so on.

Watt (1889-1896) published 6 volumes of his book entitled *A dictionary of the economic products of India* and the most referred work of twentieth century entitled *Wealth of India* is considered as its enlarged and revised edition.

The classification of Āyurvedic drugs eased the work of the scientists in the field of the drug research and it is acceptable to the Āyurvedic physicians of the 20th century also as it has been included as a part of *Dravyagūṇa* curriculum. The problems of 'controversial' drugs of Āyurveda are also being solved on these lines.

(b) *Chemical Composition and Pharmacological Actions*

The attitude of the Britishers in the beginning of the nineteenth century towards the Indian products was mainly commercial and they wanted to search useful raw materials from the huge natural resources of India, so that they could export finished materials to the other European countries. Therefore, they also concentrated on the chemical composition and the pharmacological actions of the indigenous drugs. In the beginning individual efforts were made and the observations were published in the medical journals.

The first English book which exclusively dealt with the properties and uses of the Āyurvedic drugs was of O'Shaughnessy (1841). This was followed by Dey's (1867) *Indigenous Drugs of India* and in 1868 Waring published his *Pharmacopoeia of India*, which followed by Mohideen Sheriff's supplement to it in 1869. Later on Dutt (1877) translated the Āyurvedic properties of the drug into English, which further interested the European scientists in the subject. Thereafter, the history of the drugs in the form of *Pharmacographia* was written by Fluckiger and Hanbury (1879) and Dymock (1883) wrote *Vegetable Materia Medica of Western India*.

The most commendable work of nineteenth century on the chemical composition and pharmacological action of the drugs was *Pharmacographia Indica*. In this book in addition to their own work, Dymock, Warden and Hooper (1890-93) have also given the work done by the other scientists upto that time. This work was very appreciated and being referred even today in some cases.

First Indian Medical Congress was held in 1894 at Calcutta and many papers on the identification, chemical composition, pharmacological and clinical actions of the indigenous drugs were read by the European and Indian scientists.

In this way it will not be an exaggeration if we say that at present whatever drug research on Āyurvedic plants is going on in the country, its origin can be traced in the literature of nineteenth century.

4. ĀYURVEDIC EDUCATION

Warren Hastings in 1789 started the Calcutta Madrassa by his own expenses and in 1817 Hindu College was established by public subscriptions. The East India Act 1813 authorised the Governor General of India to spend money for the promotion of education with the aims to revive and improve the sanskrit literature and introduce and promote the knowledge of European science amongst the Indians. With this aim the first Government Sanskrit College was started in 1824. In this college the medical students were taught both Western medicine and Āyurveda simultaneously. The classes for Western medicine were started in 1826, and in 1827 classes for Āyurveda were opened and Professors for teaching *Caraka*, *Suśruta*, *Bhāvaprakāśa* etc. were appointed. The duration of the course was 2 years (Mukhopadhaya 1974).

In 1833 a committee for re-examining the whole system of medical education in Bengal was appointed. This committee inspite of the opposition by Dr. Tytler, recommended the suspension of the medical classes in the Sanskrit College and Madarassa. On the recommendation of this committee the Medical College was established in 1835 and in this way the study of Āyurveda in the college gradually came to an end. Āyurvedic education again went in the hands of the traditional physicians, who kept this system alive by their personal efforts. However there is a reference which shows that at Sanskrit College, Jaipur Hindu medicine was taught systematically (Hendley 1894).

The Western scientific method adopted for the medical education in the nineteenth century was a success and it also impressed the Āyurvedic people. When in the 20th century the Āyurvedic education was revived, it rapidly changed to subjectwise. The division of subject and duration of the course etc. of Āyurveda are based on the modern scientific lines, the origin of which again can be traced in the nineteenth century.

5. HISTORY

The History of Āyurveda was the most neglected branch and, therefore, it got a negligible place in the history of medicine. The article of Wilson (1823) on the 'Medical and Surgical Sciences of Hindus' published in the *Oriental Magazine* was one of the beginning attempts to attract the historians towards Āyurveda. The works in this

direction carried out by British, German, French and Indian historians include Royle (1837), Wise (1845), Stenzler (1846), Webb (1850), Webar (1852), Brian (1858), Lietard (1863), Daremberg (1867), Manning (1869), Goldstucker (1869), Hessler (1887), Schoroedar (1887), Brendes (1891), B. Simhjee (1896), Cordier (1894, 1896), Macdonnal (1900) and so on (Mukhopadhyay, 1974).

Thus, during the nineteenth century a new branch of History of Āyurveda was developed, and now it is taught as one of the subjects in the graduate and post-graduate classes of Āyurveda.

6. DIAGNOSIS AND TREATMENT

In the nineteenth century the Western anatomy and diagnostic methods were well developed. After the establishment of medical colleges in India these methods of diagnosis were commonly practised by the Indian doctors which impressed Āyurvedic physicians also. After learning these techniques, some *vaidyas* for the beneficial of their professional community also included them in the books edited or written by them. In this regard two books, viz. *Bhaiṣajya Ratnāvalī* particularly its *Viśiṣṭa Rogādhi-kāra*, and *Āyurveda Vijñāna* require special consideration.

As mentioned earlier *Bhaiṣajya Ratnāvalī* was written by Govind Das in the eighteenth century but it was published in the nineteenth century by Vinoda Lal Sengupta, who seems to have added an appendix of 31 chapters named as *Viśiṣṭa Rogādhi-kāra* in which the then commonly found diseases described in Western medicine have been given in brief and then their detailed Āyurvedic treatment has been explained. The impact of Western medical science can be assessed by the observation given in this appendix that mercury (*pārada*) should not be used in the *Ojomeha*, i.e. proteinuria (*Bhaiṣajya Ratnāvalī* 90: 13). The treatment of *uraṣṭoya* (pleurisy) has also been described. This work gives the confidence to the Āyurvedic physicians of the twentieth century that the new diseases of modern India can also be successfully tackled by the Āyurvedic principles and the drugs.

The second book—*Āyurveda Vijñāna*—in addition to some diseases described in Western medicine has also adopted the diagnostic means of the medicine. In this book the brief anatomical descriptions of the organs like heart and lung have been given. The western medical words like heart sound (*hṛcchabada*), percussion (*abhighāta parikṣā vidhi*), auscultation (*śravana parikṣā*) etc. have been used in the clinical examination of the patient. The Western medical observations like oedema below eyes in *mūtra-piṇḍa-vikṛti* (nephritis) have also been adopted in the diagnosis of the patient.

It is obvious from the foregoing that some *vaidyas* of the nineteenth century started using the modern clinical techniques in the examination of the patient. The process continued and in the twentieth century Gana Nath Sen has written two books in Sanskrit, viz. *Siddhānta Nidānam* and *Pratyakṣa Śarīram* mainly on his modern

clinical and anatomical knowledge. Now the Western method of diagnosis are being widely used by the Āyurvedic physicians particularly in the field of research to give the 'objectivity' to their findings. The dissection of human body is a part of graduate course of Āyurveda.

7. PHARMACY

Generally Āyurvedic physicians prepared their own medicine. But when the Western medicine was introduced to India, some *vaidyas* of nineteenth century were impressed upon by the Western pharmacy system. It was very easy because the Western doctors were not to bother for the collection and the preparation of medicine. Vaidya Zandu Bhatta of Jamnagar was the first Āyurvedic physician who worked in this direction and established *Zaṇḍu Rasāyanaśālā* at Jamnagar in 1860. It was engaged in preparing the Āyurvedic medicines on the large scale and used to sell them to the Hospitals of Navanagar State and other Āyurvedic physicians of his family. This experiment was a success and later on more commercial pharmacies came into existence, out of which Dabur (Dr. S. K. Burman) and Bengal Chemical & Pharmaceutical Works (established in 1900) require special mention.

In the beginning the Āyurvedic methods were used to prepare the medicine, but later on Western technology was adopted. In this way the revolution set in the nineteenth century gave birth to the new class of commercial pharmacies, which changed the entire out look and set-up of Āyurvedic physicians and now in the absence of any 'effective control' over the drug standard of these pharmacies, the physicians are on their mercy.

It is now clear that the Western science and technology introduced by the Britishers during the nineteenth century have influenced the Āyurveda in every respect. Today the ways and means used either in respect of practice of Āyurveda or teaching in the college or research in the laboratory have entirely changed in comparison to the ancient or medieval Āyurveda. This revolution, by the influence of Western science and technology, started in the nineteenth century and now it is taking shape in the twentieth century. In a nutshell it may be said that though the soul of Āyurveda remained the same, its outer body has entirely changed by the direct or indirect influences of Western science and technology.

APPENDIX I

List of Āyurvedic Books Printed in the Nineteenth Century

1. *Abhidhāna Ratnamālā (Śadraṣa Nighaṇṭu)*: Madras, 1881.
2. *Amṛt Sāgar*: Munshi Naval Kishor Press—Lucknow, 1899.
3. *Ārogya-Darpaṇa* by Jagnatha Sharma 1893-98, Five parts.

4. *Aṣṭāṅga Hṛdaya*: Edited by Jivananda Vidyasagar, Calcutta, 1882.
5. *Aṣṭāṅga Saṃgraha*: Edited by Shree Ganesh Tarta, Calcutta, 1882.
6. *Āyurveda Saṃgraha* (in Bengali poems) by Devendra Nath Sengupta and Upendra Nath Sengupta, Calcutta.
7. *Āyurveda Vijñāna*: By Vinodlal Sengupta Calcutta 1887—with Bengali translation, Calcutta before 1887.
8. *Āyurvedīya Dravyābhidhāna*: K. B. Lal Sengupta, Calcutta, 1875.
9. *Āyurvedīya Paribhāṣa*: Barahampur, 1869.
10. *Bhaiṣajyaratnāvalī*: Calcutta, 1893.
11. *Bhāvaprakāśa*:
 - (i) With Hindi translation by Data Ram Chaubey, Bombay, 1855.
 - (ii) Edited by Jivānanda, Calcutta, 1875.
12. *Cakradatta*: with Shivadas Sen's commentary, Calcutta.
13. *Caraka Saṃhitā*:
 - (i) With Gangādhar's *Jalapakalpa* commentary, Calcutta, 1868.
 - (ii) English translation of 2 chapters in *Calcutta Journal of Medicine* by Mahendralal Sarkar 1870.
 - (iii) With Taru and Cakrapāṇi commentary, Barahampur, 1877.
 - (iv) Edited by Jivānanda Vidyāsāgar, Calcutta, 1877, 1896.
 - (v) English translation by A. C. Kaviratna, Calcutta, 1891-99.
 - (vi) Edited by Harināth Viśārād, Calcutta, 1892 (*Sūtra & Vimāna* only).
 - (vii) Edited by Devendra Nath Sen and Upendra Nath Sen, Calcutta, 1897.
 - (viii) Monograph on Caraka, by Roth. Z.D.M.G. xxvi, 441 and 448, 1872.
14. *Gadankuśa*: with Nepali translation, Banaras, 1893.
15. *Hārta Saṃhitā*. Calcutta 1887.
16. *Kāla Jñāna*—by Shambu Nath, Varanasi, 1882.
17. *Mādhava Nidāna* (i) with Madhukosa commentary; Calcutta, 1876.
(ii) Khemraj Press, Bombay, 1884.
18. *Muktāvali*: Kali Prasanna Vit, Calcutta, 1897.
19. *Nighaṅṣu Ratnākara*:
 - (i) Vishnuvasdev Godvale, Bombay, 1867.
 - (ii) With Hindi translation by Ravidatta Vaidya—Lucknow, 1892 (Second edition).
20. *Nūtan Amṛt Sāgar*: Bombay, Samvat 1947 (1894 A.D.).
21. *Rājavallabha Nighaṅṣu*: with Śāligrām Vaiśya commentary, Vainkateshvara Press Bombay, Samvat 1952 (1895 A.D.).
22. *Rasa Ratnākara*:
 - (i) Edited by Jivananda, Calcutta, 1878.
 - (ii) Khemraj, Bombay, Samvat 1954 (1897 A.D.).
23. *Rasendra Cintāmaṇi*: Edited by Jivananda Vidyasagar (Calcutta, 1878).
24. *Śārṅgadhara Saṃhitā*:
 - (i) With Bengali translation by Priyamohan Sengupta, Calcutta, 1892.
 - (ii) With *Śārṅgadhara Sudhākara* commentary by Baija Nath Saraswat, Mirzapur, Samvat 1900 (1844 A.D.).

25. *Siddha Mantra*: edited by Shankara Das Shastripade, Jnana Sagar Press, Bombay, 1898.
26. *Suśruta Saṃhitā*:
 - (i) Edited by Madhu Sudan Gupta, Calcutta, 1835.
 - (ii) Latin translation by Hesaler, 1844.
 - (iii) Edited by Jivananda, 1877.
 - (iv) English translation of 42 chapters of *Sūtra Sthāna* by U. C. Datta, 1883.
 - (v) English translation of 46 chapters of *Sūtra Sthāna* by A. C. Chattopadhyay, 1891.
 - (vi) English translation of 14 chapters of *Sūtra Sthāna* by Harnley 1897.
27. *Vaidyacintāmaṇi*: with Telugu translation, Madras.
28. *Vaidya Jivana*: with sanskrit and Hindi commentary, Banaras, 1880.
29. *Vaidyaka-Sāra*: with Hindi translation, Bombay 1896.
30. *Vaidyāmṛta*:
 - (i) with Marathi translation by Krishna Shastri Bhatavadekae, Bombay, 1862 (IV edition).
 - (ii) with Hindi translation by Jyotisvarup, Banaras, 1867.
 - (iii) with Simhali translation, Colombo, 1870.
31. *Vaṅgasena*: Calcutta, 1884.
32. *Vīrāmitrodaya*: Edited by Jivananda, Calcutta, 1875.
33. *Vīrasīṃhāvaloka*, Bombay, 1888.
34. *Vṛndamādhava*: Anandashram, Pune, 1894.
35. *Yogarātnākara*: Anandashram, Pune, 1889.

APPENDIX 2

List of the Books on the Indigenous Drug

(19th Century)

1. Ainslie, W. (1813): *Materia Medica of Hindoostan*.
2. ——— (1826): *Materia Indica*, 2 vols.
3. Beddome (1863-70): *Ferns of S. India*, 2 vols. and supplement.
4. ——— (1868-74): *Icones plantarum Indiae orientalis*.
5. ——— (1869): *Ferns of British India*.
6. ——— (1869-73): *Flora Sylvatica of S. India*. 2 vols.
7. Bentley and Trimen (1880): *Medicinal plants*, 4 vols.
8. Birdwood, G. (1865): *Vegetable products of Bombay Presidency*.
9. Baden Powell (1868): *Punjab products*, 2 vols.
10. Boisser (1867): *Flora orientalis*.
11. Butter, D. (1839): *Medical Topography of ocidh*.
12. Dey, K. L. (1867): *Indigenous drugs of India*, II edn. 1896.
13. Dollard, W. (1840): *Medical topography of Kumaon and Shone valley*.

14. Drury, H. (1873): *Useful plants of India*.
15. Dutt, V. C. (1877): *Materia medica of the Hindus*.
16. Dymock, W. (1883): *Vegetable materia medica of western India*.
17. Dymock and Godgil: *The vegetable materia medica of Hindus*.
18. Dymock, Warden and Hooper (1890-93): *Pharmacographia Indica*, 3 vols.
19. Fleming, J. (1810): *Catalogue of Indian medicinal plants and drugs*.
20. Fluckiger and Hanburg (1879): *Pharmacographia*.
21. Grabe (1882): *Die Indioschen Mineralian*.
22. Hooker, J. D. (1872-79): *Flora of British India*, 7 vols.
23. Indian and colonial addendum to the *British pharmacopoeia* 1900.
24. Irvine, R. H. (1841): *General medical topography of Ajmere*.
25. ——— (1848): *Materia medica of Patna*.
26. John Cameron (1894): *Forest trees of Mysore and Coorg*.
27. Jones, W: *Botanical observation on select plants. Early 18th century*.
28. Khory, R. N. (1887): *The Bombay materia medica and their therapeutics*.
29. Kirtikar (1890): *Botanical characters of Indian poisonous plants, in Lyon's Medical Jurisprudence for India*.
30. Kurz (1877): *Forest flora of British Burma*.
31. Lindley (1838): *Flora medica*.
32. McCosh, J. (1837): *Topography of Assam*.
33. Mohideen Sheriff (1869): Supplement to the *Pharmacopoeia of India*.
34. ——— (1891): *Materia medica of Madras*.
35. Murray, J. A. (1881): *Plants and drugs of sind*.
36. O'Shaughnessy (1841): *Bengal Dispensatory and Pharmacopoeia*.
37. Pal N. C. (1873): *Indian Herbalist*.
38. Roxburgh (1820, 1824, 1832): *Flora Indica*, I vol 1820, II vol. 1824, III vol. 1832, Reprint, 1874.
39. Royle (1839): *Illustrations of the Botany of the Himalayan Mountains and the flora of Cashmere*.
40. ———(1840): *The productive resources of India*.
41. ———(1845): *A Manual of Materia Medica*.
42. ———(1854): *The commercial products of India and the East*.
43. Sakharam, Arjoon (1879): *Catalogue of the Bombay drugs*.
44. Stawart, J. L. (1869): *Punjab plants*.
45. ———(1874): *Illustration of the forest flora of N. W. and Central India*.
46. Strachey (1852): *Catalogue of the plants of Kumaon Garhwal and Tibet*.
47. The second report of the Indigenous drugs committee, Simla 1900.
48. Wallich (1836): *Coptis Teeta*, *Trans. of Med. and Phys. Soc. of Calcutta*, VIII, 1836, reprinted in *Pereira's Mat. Med.*
49. Waring E. J. (1868): *Pharmacopoeia of India*.
50. ——— (1874): *Bazar Medicine*.
51. Waston (1868): *Index to the names of Indian Plants*.
52. Watt. G. (1889-96): *A Dictionary of the economic products of India*, 6 vols.

APPENDIX 3

*List of the Important Publications of 19th Century
Pertaining to History of Indian Medicine*

1. B. Simhjee, *A short history of Indian Medical Science*, London, 1896.
2. *Bower Manuscript* edited by A. F. R. Hoernle, Archaeological Survey of India. New Imperial series, vol. 22, Calcutta 1893-1912.
3. Brian, *Coup d'oeil sur la Medicin des Anciens Indians*, Paris, 1858.
4. Brendes, *Die Pharmacie beiden alten culturvolkern Halle*, 1, 1-30, 1891.
5. Cordier, *Etudes bur la Medecine Hindone temps. Vediques et heroiques*, Paris, 1894.
6. ——*Vāgbhaṭa et l'Aṣṭāṅgahrdayasaṃhitā*. Besancon, 1896.
7. ——*Nāgārjuna et l'Uttaratantra de la Sucruta Samhita*, Anantarivo, 1896.
8. Daremberg, Recherches Sur l'etat de la medicine, *Ann. Med.* Paris, 1867.
9. ——La Medecine Charaka, etc. in *Bull de l'Ac. de Med.* May 11, 1897.
10. ——"Suocruta" Dict. *Encyclop, des sciences medicales*.
11. Dutt, *History of civilization in Ancient India*, Calcutta, 1890.
12. Goldstucker, In Mrs. Manning's *Ancient and Medieval India*, London, 1869.
13. Grohmann, Medicinischesaus dem Atharva Veda mit pesonderem Bezug auf den Takman, in 1st IX 381 ff. IS, IX 381, 1865.
14. Hass, *Die Heiratsbrauche der Altin Inder Webers Indische studien*, 1862.
15. Hendley, The Indian system of medicine and the lesson that may be learnt from them, *Trans. First Ind. Med. Cong.* 1894.
16. Hessler, Der Ayurveda des Sushruta, *Erlangae*, I 1844, II, 1847.
17. ——Allgemeine Übersicht der Heilkunde der altern Inder. Sitzungsberg, Math. Phys. Cl., Munchen, 1, 137-49, 1887.
18. Hoernle, *Bower manuscript* with English translation Calcutta, 1895.
19. Lietard, *Letters historiques Sur l'etat de la Medicine chez les Hindous*, Paris, 1863.
20. Macdonel, *History of Sanskrit literature*, London, 1900.
21. Mrs. Manning, *Ancient and Medieval India*, London, 1869.
22. Muller, A, in volume XXXIV of *J. Germ. or Soc. Z.D.M.G.* p. 465, 1880.
23. Roth, *Monograph on Caraka Z.D.M.G.* XXVI, 441 & 448, 1872.
24. Royle, *An essay on the antiquity of Hindu medicine*, London, 1837, Cassel 1839.
25. Schroeder, *Indians' Literature and Culture*, Leipzig, 729-33, 1887.
26. Stenzler, Zur Geschichte de Ind. Medicin, *Janus*, 1, 411-54, Breslau, 1846.
27. Ward, *Hist., Lit. Mytho. of the Hindoos*, Serampore, 1815-18.
28. Webb, The historical relations of ancient Hindu with Greek medicine, Calcutta, 1850.
29. Weber, *History of Sanskrit Literature*, (1852, 1876).
30. Wilson, On the medical and surgical sciences of the Hindus. *Oriental Magazine*, 1823, Works 3, 269-76, 380-93, London, 1864.
31. Wise, *Commentary on the Hindu System of Medicine*, Calcutta, 1845; London, 1860 and 1900.
32. ——Medical knowledge of the Hindus, *Lancet*, Vol. II, 1846.
33. ——*Review of the History of Medicine*, London, 1867.

APPENDIX 4

*List of the Important Sanskrit Manuscript
Catalogues of 19th Century*

1. A catalogue raisonne of oriental Mss. in the Library of College, Fort St. George, 3 vols. Madras 1851-62. By Taylor.
2. A classified Index to the Sanskrit Mss. in the palace at Tanjore—By Burnell, London, 1880.
3. Bhandarkar's report on the search of Sanskrit Mss. in the Bombay Presidency, Bombay, 1893.
4. Catalogi Codieum Manuscriptorum biblio thecae Bodlianae eodices Sanscriteos, by Aufracht. Oxford, 1869.
5. Catalogue of Mss. in the Durbar Library in Nepal.
6. Catalogue of Sanskrit Mss. in the Library of H.H. the Maharaj of Ulwar, by Peterson, Bombay, 1892.
7. Catalogue of Sanskrit Mss. in the Library of the Asiatic Society of Bengal.
8. Catalogue, Sanskrit College Library, Calcutta.
9. Catalogus Catalogorum, Leipzig, 1891, Supplement, 1896.
10. Classified alphabetical catalogue of Sanskrit Mss. in South division of the Bombay Presidency—by Kielhorn, Bombay, 1869.
11. Notices of Sanskrit Mss. in the Asiatic Society of Bengal—by R. L. Mitra vol. I-IX, Calcutta, 1880 and By H. P. Sastri vol. X and XI.
12. Report in the search of Sanskrit Mss. 1895-1900 by H. P. Sastri.
13. Report in the search of Sanskrit Mss. by Peterson,
14. Report on the Search for Sanskrit Mss. in the Bombay Presidency, Bombay, 1880-81.
15. Sanskrit Mss. in the Library of H. H. the Maharaja of Bikaner—A catalogue—By R. L. Mitra, Calcutta.
16. The Sanskrit Buddhist Literature of Nepal—by R. L. Mitra Calcutta, 1882.
17. Weber's Berlin Catalogue.
18. Zeitschrift der Deutschen Morgenlaudischen Gesoelschaft (Z.D.M.G.).

APPENDIX 5

Books Referred of 20th century

1. Chopra, R. N., Chopra, I.C., Handa, K. L. and Kapur, L. D.: *Indigenous Drugs of India*, U. M. Dhar, Calcutta, 1958.
2. Jolly, J., *Indian Medicine* (Translated in English by C. G. Kashikar) Poona, 1951.
3. Kutumbiah, P., *Ancient Indian Medicine*, Orient Longmans, Madras, 1962.
4. Mukhopadhyaya, G. M., *History of Indian Medicine*, Vols. I, II, III, Second edition. Oriental Books Reprint Corporation, New Delhi, 1974.
5. Sharma, P. V., *Āyurveda Kā Vaijñānika Itihāsa*, Chaukhambha Orientalia, 1975.
6. Vidyalankar, A., *Āyurveda Kā Bṛhat Itihāsa*, Hindi Samiti, Govt. of U.P., Lucknow, II, ed. 1976.
7. *Wealth of India*, Council for Scientific and Industrial Research, New Delhi, 1969.