

## HISTORICAL NOTES

### **KHEM SINGH GREWAL (1894-1965) — A PROMINENT MEDICO-PHARMACEUTICAL PROFESSIONAL\***

Professor Khem Singh Grewal (1894-1965) was a well established pharmacologist of his time. He worked with savants of pharmacology like Professor Ram Nath Chopra, Professor Joshua Harold Burn and Professor Walter Ernest Dixon. His academic bases remained the King Edward Medical College, Lahore, and the Assam Medical College, Dibrugarh. He had varied research interests, including study of medicinal plants. He participated in carrying out a comprehensive survey of incidence of cancer in India. Professor Grewal also had deep interest in pharmaceutical developments. He was associated with different pharmaceutical professional and statutory bodies. His most conspicuous pharmaceutical contribution remains the founding of pharmaceutical education at the University of the Panjab, Lahore, the nucleus which has developed into the University Institute of Pharmaceutical Sciences of the Panjab University at Chandigarh.

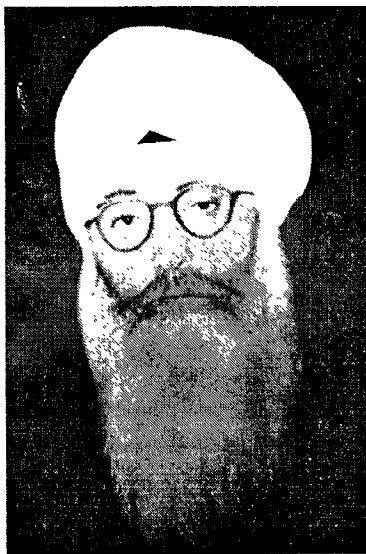
**Key words:** Cancer, Drug addiction, Drug control, Medicinal plants, Opium habit, Pharmaceutical education, Pharmacology, Pharmacy practice, University Institute of Pharmaceutical Sciences (Panjab University, Chandigarh).

#### **Introduction**

Khem Singh Grewal was an accomplished pharmacologist of his time, who also had deep interest in pharmaceutical developments in the country. Grewal had the privilege of working with very eminent pharmacologists of the period. His academic career was largely spent at the King Edward Medical College, Lahore, and Assam Medical College, Dibrugarh. His research interests were mostly in pharmacological studies related to natural products. He was associated with several pharmaceutical bodies. His most conspicuous pharmaceutical contribution was the founding

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**Khem Singh Grewal (1894 -1965)**  
(Photo courtesy of his son Ripdaman Singh Grewal)

of pharmaceutical education at the University of the Panjab, Lahore. A continuum of the Lahore centre is the University Institute of Pharmaceutical Sciences, Panjab University, Chandigarh, which stands as a living memorial to the pioneering Grewal.

The life and contributions of Khem Singh Grewal are covered under the heads: Early Life and Studies; Pharmacologist Grewal; Participant in Pharmaceutical Developments; and Founder of Pharmaceutical Education at the Panjab University.

#### **Early Life and Studies**

Narangwal in Ludhiana district of the Punjab was ancestral village of Khem Singh Grewal. It has been possible to obtain some personal particulars about him, from the form which he filled in early 1929 to join the Fitzwilliam House, Cambridge.<sup>1</sup> Khem Singh was born at Narangwal on 15 November 1894. His father Bhola Singh retired as S.D.O. (Canal). Khem Singh had his schooling at Khalsa Collegiate School, Amritsar, till 1912, and during 1912-14 he studied at Dyal Singh College, Lahore. For his M.B.B.S. degree from the University of the Panjab, he was student at the King Edward Medical College, Lahore (1914-19).

### **Pharmacologist Grewal**

After his medical graduation Khem Singh Grewal joined the Provincial Civil Medical Service (P.C.M.S).<sup>3</sup> He was posted as demonstrator at the Department of Materia Medica of the K. E. Medical College and was attached to the outpatient department in medicine.

Grewal's grooming as a pharmacologist really started through his working with Col. Ram Nath Chopra at Calcutta School of Tropical Medicine. The Punjab Government deputed him for training in experimental pharmacology. He worked at the School from 1925 to 1927.<sup>5-7</sup> Grewal engaged in the Drug Addiction Enquiry supported by the Indian Research Fund Association.<sup>8</sup> His research pertained to opium addiction, oldest of all drug habits in India. Work was carried out on opium habit, analysing the position in sections of population and regions of the country.<sup>9-11</sup> Say, in the Punjab, though the addiction was not widespread but was confined to certain communities and areas.<sup>11</sup> The rise in opium consumption was almost parallel in the percentage of Sikhs, among the population. In certain parts of the Punjab and Rajasthan States were used poppy capsules, for addiction.<sup>12</sup>

After his training at the Calcutta School under Col. Chopra, Grewal returned to his original position at Lahore. Later, he proceeded to England for his Ph.D. research. Interestingly, he chose to study at the University of Cambridge, and work under R. N. Chopra's teacher famous Walter Ernest Dixon, who had greatly inspired Chopra in creating in him a deep interest in experimental pharmacology. Grewal was admitted to the University of Cambridge as a research student in January 1929.<sup>13</sup>

In the summer of 1929, Grewal worked at the Pharmacological Laboratory, Pharmaceutical Society of Great Britain, London.<sup>14,15</sup> There he associated with another doyen of pharmacology Joshua Harold Burn. They together published a paper, in which there was reported the work on comparing strength of some tinctures of strophanthus and commercial samples of strophanthin with ouabain which had been adopted as international standard for strophanthus by the Health Organization of the League of Nations.<sup>16</sup>

At Cambridge Khem Singh was able to complete his research and submit the dissertation in November 1930.<sup>13</sup> The degree was conferred, in Grewal's absence, in April 1931.

The title of his dissertation was 'Drug Addiction.'<sup>13,17,18</sup> The research mainly was on the pharmacology of mitragynine, an alkaloid from the leaves of *Mitragyne speciosa*. The leaves, under the name Kratom, were in use in Peninsular Siam (present day Thailand) as a habit drug. Mitragynine fumarate and mitragynine acetate were used for the studies. Later, in a published paper Grewal reported that mitragynine had depressant action on isolated tissues, facilitated the autonomic nervous system and increased excitability of the medulla and probably of the motor centres.<sup>19</sup> The investigations described did not assist in explaining its action as a drug of addiction. In man, mitragynine acetate seemed to increase work as registered by the ergograph and to increase heat tolerance.<sup>20</sup>

In the dissertation there was included a manuscript of a study on a derivative of hexylresorcinol, which was published subsequently.<sup>21</sup>

It may be noted that the doctoral research was submitted after a work of around two years. Possibly credit was given for the other research carried out by Grewal, since with the dissertation were appended papers on opium habits.<sup>9,10,12</sup> and studies related to strophanthus.<sup>16</sup>



**Khem Singh Grewal during his years at Cambridge**  
(Photo courtesy of R. S. Grewal)

On return home from Cambridge, Dr Grewal was appointed as Assistant Professor at the K. E. Medical College.<sup>3</sup> He was promoted as Professor of Pharmacology in 1940, the position which he held till the time of partition of the country in 1947.

The Department of Pharmacology became a very active research centre.<sup>3</sup> Grewal trained several research workers. The Department was upgraded for postgraduate teaching in pharmacology and several staff members obtained M.D. degrees. Grewal also attracted chemistry postgraduates to work with him.<sup>22,23</sup>

Khem Singh emerged as an accomplished pharmacologist of his time. He had varied research interests, including study of indigenous drugs.<sup>3</sup> On partition of the country his personal papers were left back at Lahore. A reference may be made to some of his published research papers which have been traced. He studied vitamin A content of ghee on albino rats.<sup>24</sup> It was shown that ghee prepared from centrifuged butter had larger content of vitamin A; however, there was loss of some of the vitamin A content in the ghee prepared by the traditional Indian method. A study by chemical analysis showed that the ghee samples collected from the market were largely adulterated.<sup>25</sup> A gross adulteration was also seen in some indigenous drugs sold in the market.<sup>26</sup> In a study, fate of carotene after its introduction into the venous circulation of some species of animals was attempted.<sup>27</sup> Another investigation related to pharmacological action of certain derivatives of cotarnine.<sup>28</sup>

A reference is necessary to pains-taking comprehensive survey carried out on incidence of cancer in India, through study of hospital records from different provinces in the country.<sup>29</sup> The maximum incidence in India was of the cancer of the gastrointestinal tract. Buccal cancer occupied a prominent position. The penile cancer being a disease of the uncircumcized, the incidence among muslims was negligible. An enormous data on incidence of different types of cancer was collected, which were carefully tabulated and analysed, with respect to regional distribution and according to the communities.

Dr Grewal himself could come out of Pakistan by the end of August 1947, leaving behind all his possessions.<sup>3</sup> For a few months he was Principal of the Glancy Medical College at Amritsar and then held the position of Deputy Director of Health Services, Punjab. He functioned as Assistant Inspector General of Civil Hospitals, East Punjab, Kasauli.<sup>30</sup>

Dr Grewal took retirement from the Punjab Service and reverted to his first love of teaching and research as Professor of Pharmacology at Assam Medical College, Dibrugarh.<sup>3</sup> He remained there from early 1949 to

June 1955. Then he joined the Medical College, Patiala, as Professor of Pharmacology and Medical Superintendent; he finally retired in the summer of 1956.

As Grewal was always interested in medicinal plants, he on retirement as an academic bought two villages in Solan district, Himachal Pradesh, to set up an experimental farm at Khaltoo.<sup>3</sup> Further particulars about his medicinal plants farm are not available.

### **Participant in Pharmaceutical Developments**

Through his interaction with Col. R. N. Chopra during the period Khem Singh Grewal spent at the School of Tropical Medicine at Calcutta, he must have got better informed about underdevelopment of pharmacy in India and there being no check on the quality of drugs available in the market. As years passed and the sad state of affairs in this context got examined by the Drugs Enquiry Committee (1930-31) headed by Chopra, and the remedial measures which were recommended,<sup>31,32</sup> created awareness for need of necessary action to correct the prevailing situation. Grewal's mind must have been receptive to all these developments.

When Grewal spent the summer of 1929 at the Pharmacological Laboratory of the Pharmaceutical Society of Great Britain, headed by Dr J. H. Burn,<sup>33</sup> he must have got to know about the education system in operation at the College of Pharmaceutical Society, which was located at the same premises, the Bloomsbury Square, London.

It is apparent that by the time Grewal returned to his base at the King Edward Medical College, Lahore, in 1931, he must have had sufficient understanding of pharmacy as was practised in England and awakening about pharmaceutical deficiencies confronting his home country.

Khem Singh joined the United Provinces' Pharmaceutical Association, later changing to the Indian Pharmaceutical Association, operating from the Banaras Hindu University. He was elected as an ordinary member in March 1939.<sup>34</sup> In view of his professional status, Grewal was taken on the editorial board of the *Indian Journal of Pharmacy*.<sup>35</sup> He continued to be on the Board for several years.<sup>36</sup>

Grewal was an academic and his major interest remained in pharmaceutical education. His most significant pharmaceutical contribution is considered to be the founding of pharmaceutical education at the University of the Panjab, the details about which are outlined separately in the succeeding section.

K. S. Grewal submitted a memorandum on 'Pharmacy Training in India' to the Health Survey and Development Committee (Chairman: Sir Joseph Bhore).<sup>38</sup> Grewal was a member of the sub-committee on pharmaceutical education which gave evidence before the committee in January 1944.<sup>39</sup> He continued to keep his interest in education for pharmacists. In later years also, he impressed the need to establish good institutions for imparting better pharmaceutical education.<sup>40</sup>

In addition to promotion of pharmaceutical education, Grewal was also involved during the pharmaceutical history-making years in matters related to drugs control and making of pharmacopoeial publications.

It has been stated that Dr K. S. Grewal acted as the first Drugs Controller, Punjab, in addition to being Professor of Pharmacology.<sup>3</sup> Knowing that the enforcement of Drugs Act and Rules having taken place for the first time from 1 April 1947, the Grewal's acting as drugs controller was apparently while he was at Lahore, for which no documents are available. It is on record that Grewal became member of the Drugs Technical Advisory Board<sup>41</sup> and Drugs Consultative Committee.<sup>42</sup> In the reports regarding membership of both these bodies, against Grewal's name his designation has been mentioned as Assistant Inspector General of Civil Hospitals, East Punjab. From the papers which have become available, Grewal attended the first meeting of the Drugs Consultative Committee, where he was put on the subcommittees to investigate the problem regarding Ayurvedic and Unani patent medicines composed partly of Allopathic medicines, and matters relating to dual purpose items, such as glucose, used both as food items and as drugs.<sup>43</sup>

Grewal worked as a member of the pharmacology subcommittee for 1955 Pharmacopoeia of India.<sup>44</sup>

#### **Founder of Pharmaceutical Education at the Panjab University**

For introduction of the B.Pharm. course at the University of the Panjab, Lahore in 1944, it was K. S. Grewal who was instrumental in founding

the degree.<sup>2,3</sup> There is available supporting material for a reasonable description of the background leading to inception of pharmaceutical education at Lahore.

It appears that the move for opening B.Pharm. degree course at the University of the Panjab started in the 1930s. This is partly borne out from some discussions which took place at the first All India Pharmaceutical Conference held at the Banaras Hindu University in the first week of January 1941.<sup>45</sup> At a symposium Dr B. Mukerji made some remarks in favour of pharmacologists.<sup>46</sup> This prompted Dr J. N. Ray<sup>47</sup> to refer to the B.Pharm. course which the pharmacologists of the Medical College were keen to start at the University of the Panjab.<sup>45</sup> He said that the course proposed was heavily loaded with pharmacology and he got the lopsidedness corrected when he was put on the committee for framing the course by the University; the dispensing part was also cut down. This reference shows that the move for initiating B.Pharm. came from the King Edward Medical College, and apparently Dr Khem Singh Grewal was initiator of the move, who had been exposed to pharmaceutical education setup and views of its proponents.

The papers of the University of the Panjab regarding the above committee work are not available. However, there is a reference to appointment of a six member committee by the University to draft regulations for the degree of Bachelor of Pharmacy.<sup>48</sup> Dr Bashir Ahmad<sup>49</sup> and Dr Khem Singh Grewal were members of the committee. In a fortnight the recommendations of the committee became available for consideration of the syndicate.<sup>50</sup> It was recommended that the B.Pharm. course was to be of three years' duration after F.Sc. (Medical). The students were to enroll with the K. E. Medical College. The teaching of pharmaceutical chemistry (with the University Chemical Laboratories), pharmaceutics (mainly in Pharmacology Department of the K. E. Medical College), pharmacognosy (in the University Department of Botany) and physiology including pharmacology (in the respective Departments of the K. E. Medical College) was to start simultaneously. These recommendations were approved by the syndicate in two weeks.<sup>51</sup> The things moved very fast as if the course was to start from the 1942-43 academic session. Possibly the financial constraint came in the way. The Punjab Government agreed to provide grant-in-aid of Rs10,000 per annum for the course from 1944-45,<sup>52</sup> and the University decided to hold the admission in the last week of September 1944.<sup>53</sup> All these developments took place during difficult period of the second world war.



The University of the Panjab became the second institution next to the Banaras Hindu University to have a B.Pharm. course. From the above citations and information from the pharmacy students of the time,<sup>54,55</sup> it comes out that Khem Singh Grewal was the spirit behind founding the B.Pharm. course at Lahore. 'It can be said without fear of contradiction that without Dr Grewal's keen interest in the matter, the B.Pharmacy course might have never been started at the Panjab University.'<sup>54</sup>

It is evident that Grewal was the founder of pharmaceutical education at the University of the Panjab, Lahore. It needs a little elaboration as to the scope and content of the B.Pharm. course as he visualised. It looks that he was for making professional pharmacy as the major strength of the syllabus. He was apparently influenced by the kind of education given at the College of Pharmaceutical Society (University of London), later getting called the School of Pharmacy. Dr J. H. Burn, with whom Grewal worked during 1929, later became Dean of the College (1933-37). Burn stood 'for a close integration between pharmacy and medicine.'<sup>33</sup> As the Dean he 'drew up the first syllabus, which included pharmacology in the curriculum of pharmacists, raising the level of pharmaceutical training to full University standards.'

When the B.Pharm. course contents were first designed for B.Pharm. by K. S. Grewal, it may have been in consonance with Dean Burn's philosophy regarding education for pharmacists, to which Dr J. N. Ray strongly objected.<sup>45,47</sup> For want of the relevant papers, it is not possible to comment on what Grewal presented and to what extent the proposed syllabus was modified. But one thing is certain that the direction towards professional pharmacy was not completely overlooked, though the course content in this respect was diluted. The B.Pharm. students were required to go in for three months' dispensary training, as part of the studies.<sup>56</sup>

The centre of pharmaceutical instructions created in 1944 at Lahore shifted to Amritsar in 1947 and then to Chandigarh. This is now designated as the University Institute of Pharmaceutical Sciences (UIPS) of the Panjab University. The Institute is a continuum of the facilities organised at Lahore. It is a living memorial to the pioneering farsightedness of Khem Singh Grewal.<sup>57</sup>

It can be said that when the focus of the graduate level pharmaceutical instructions gets primarily centered around professional pharmacy which we

now call pharmacy practice, as is the case world over, the credit for first having such a vision in India will go to Dr Khem Singh Grewal.

While closing a note may be made of what those who had known Grewal first hand write about his personality traits.<sup>3,22</sup> 'He was really a rare type of person a gentleman in the real sense of the word. He was very religious minded.'<sup>22</sup>

Grewal 'was an excellent lecturer and made the subject of pharmacology very interesting and exciting. He was an original thinker with an open mind. He always brought to bear a new insight on to any problem he looked at. He was a very kind and compassionate man and helped a large number of people. He was a good sportsman, enjoyed riding and shooting in his younger days and played tennis till the last day of his retirement. He was a good tennis player and had played tennis at Cambridge for his college.'<sup>3</sup>

Dr Khem Singh Grewal passed away on 10 December 1965 at Khaltoo.<sup>3</sup>

#### Acknowledgement

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#### References and Notes

1. Application for admission to Fitzwilliam House, Cambridge. K. S. Grewal filled the form in his own hand and signed it on 12 January 1929. A photocopy supplied by Mrs Pearl Watts, College and Accommodation Office, Fitzwilliam College, Cambridge, along with her letter of 26 October 1994. (The Fitzwilliam House later became Fitzwilliam College.) After authentic information having become available through this source, certain of the personal particulars given in reference 2 stand invalidated.
2. H. Singh, "Pharmacy at Pre-Partition Lahore," *Eastern Pharmacist*, 37(December) (1994) 49-53. Some of the particulars given in this reference now stand modified in light of better understanding and more information becoming available.
3. R. S. Grewal, *personal communication*, through his letter dated 24 May 1994 and visit to me a little later. Dr Riddaman Singh Grewal distinguished himself as a pharmacologist in his own right. He became Director of the Hindustan Ciba-Geigy Research Centre, Bombay.

4. *Annual Reports of the Calcutta School of Tropical Medicine, Institute of Hygiene and the Carmichael Hospital for Tropical Diseases.*
5. Ref. 4, 1925, p 77. A mention was made about 'Assistant Surgeon Dr Khem Singh Grewal' under training in the laboratory.
6. Ref. 4, 1926, p 59. It is mentioned that he was 'deputed last year.'
7. Ref. 4, 1927, p 55. It is recorded that he 'returned' to his province.
8. Ref. 4, 1926, p iv.
9. R. N. Chopra and K. S. Grewal, "The Opium Habit in India," *Transactions of the Far Eastern Association of Tropical Medicine*, Seventh Congress held in India, December 1927, Thacker's Press and Directories, Ltd., 1929. pp 568-575.
10. R. N. Chopra and K. S. Grewal, "Opium Habit in India. An Analysis of 100 Cases among the Sikh Population in Calcutta," *Indian Journal of Medical Research*, 15 (1927-28) 57-65.
11. R. N. Chopra, G. S. Chopra and K. S. Grewal, "Opium Habit in the Punjab," *Indian Journal of Medical Research*, 20 (1932-33) 545-564.
12. R. N. Chopra, K. S. Grewal, J. S. Chowhan and G. S. Chopra, "Addiction to 'Post' (Unlanced Capsules of *Papaver somniferum*)," *Indian Journal of Medical Research*, 17 (1929-30) 985-1007.
13. As per information received through letter dated 20 June 1994 from E. S. Leedham-Green, Deputy Keeper of Manuscripts and University Archives, University of Cambridge.
14. Ref. 3. It is stated that 'during one summer he worked with Prof. J. H. Burn on bioassay technique at School of Pharmacy, Bloomsbury Square, London.'
15. It is not that he worked with J. H. Burn, before his going to the University of Cambridge, as mentioned in reference 2.
16. J. H. Burn and K. S. Grewal, "The Strength of Tinctures of Strophanthus, B. P., and of Samples of Strophanthin Related to the International Standards of Ouabain," *Yearbook of Pharmacy including Quarterly Journal of Pharmacy and Pharmacology*, 2 (1929) 404-408. 19 September 1929 is recorded as the date of receipt of the manuscript.
17. During the fall of 1995 I was at London collecting archival material for my history research. On 27 October 1995 I made a special visit to the University Library, Cambridge, to have a look at the Grewal's dissertation.
18. Khem Singh Grewal, "Drug Addiction," Non-Collegiate Student, Cambridge, and the University of the Panjab, Ph.D. Dissertation 399.
19. K. S. Grewal, "The Pharmacology of Mitragnine," *Journal of Pharmacology and Experimental Therapeutics*, 46 (1932) 251-271.

20. Ref. 18, "Effect of Mitragynine on Man," pp 110-151.
21. K. S. Grewal, "A Soluble Derivative of Hexylresorcinol," *Journal of Pharmacology and Experimental Therapeutics*, 45 (1932) 283-290. It pertained to biological studies on sodium hexylresorcinol disulphate.
22. Kundan Singh, *personal communication*, through his letter of 30 June 1994. He worked with Professor Grewal from October 1945 to 15 August 1947. He investigated *Herpestis monniera*.
23. References 3 and 22. Other chemistry postgraduates who worked with Grewal included Bashesar Das Kochhar, Nazar Singh, Kesar Singh and Inder Sen Gupta. In later years Nazar Singh and Kundan Singh remained on the faculty of the Panjab University, teaching pharmaceutical chemistry; Inder Sen Gupta was also with the Panjab University on chemical engineering teaching faculty.
24. K. S. Grewal, "The Vitamin A Content of Ghee," *Quarterly Journal of Pharmacy and Pharmacology*, 6 (1933) 650-654.
25. K. S. Grewal and B. D. Kochhar, "Vitamin A Contents of Ghee," *Indian Journal of Medical Research*, 25 (1938) 623-631.
26. K. S. Grewal and B. D. Kochhar, "Chemical Assay of 'Rasaut' and 'Hing' from the Punjab Market," *Indian Journal of Medical Research*, 28 (1940) 463-468.
27. B. Ahmad, K. S. Grewal and K. S. Malick, "Further Observations on the Metabolism of Carotene," *Indian Medical Gazette*, 69 (1934) 320-323.
28. K. S. Grewal, B. D. Kochhar and J. N. Ray, "Pharmacological Action of Certain Derivatives of Cotarnine," *Indian Journal of Medical Research*, 21 (1933) 249-253.
29. V. Nath and K. S. Grewal, "Cancer in India," *Indian Journal of Medical Research*, 23 (1935) 149-190; *ibid.*, 24 (1937) 633-666; *ibid.*, 26 (1939) 785-832.
30. In that capacity Grewal signed the testimonial which he issued to Nanak Chand (Chaudhry) who had topped in the B.Pharm. examination held by the University of the Panjab, Lahore, in 1947. The original testimonial is available in my collection. It is undated. According to N. C. Chaudhry, the testimonial was received sometime in September/October 1948.
31. *Report of the Drugs Enquiry Committee 1930-31*, Government of India, Central Publication Branch, Calcutta, 1931.
32. H. Singh, "Drugs Enquiry Committee 1930-31," *Eastern Pharmacist*, 44 (November) (2001) 21-25.
33. E. Bulbring and J. M. Walker, "Joshua Harold Burn (6 March 1892 -13 July 1981)," *Biographical Memoirs of Fellows of the Royal Society*, 30 (1984) 45-89. Dr Burn was appointed Director of Pharmacological Laboratory of the Pharmaceutical Society of Great Britain in 1926. He held the position of Dean of the College of Pharmaceutical Society for the period 1933-37, before moving to the University of Oxford.

34. *Proceedings of the UPPA Council Meeting*, 20 March 1939, item 5; *Indian Journal of Pharmacy*, 1 (1939) 92.
35. *Proceedings of the UPPA Annual General Meeting*, 27 September 1939; *Indian Journal of Pharmacy*, 1 (1939) 219.
36. *Proceedings of the IPA Annual General Meetings*, 3 January 1941; *Indian Journal of Pharmacy*; 3 (1941) 51; 2 January 1942, *ibid.*, 4 (1942) 49 ; 8 January 1943, *ibid.*, 5 (1943) 44; 5 January 1944, *ibid.*, 6 (1944) 35.
37. *Report of the Health Survey and Development Committee, Volumes I-IV*, Manager of Publications, Government of India, Delhi, 1946.
38. Ref. 37, *Volume III*, p 343.
39. "Proceedings of the Preliminary Meeting of the Pharmaceutical Subcommittee on Pharmaceutical Education," and the "Memorandum on Pharmaceutical Education," *Indian Journal of Pharmacy*," 6 (1944) 37-39.
40. *Indian Pharmacist*, 10 (1954-55) 204.
41. "Drugs Technical Advisory Board," *Indian Journal of Pharmacy*, 10 (1948) 51. K. S. Grewal was elected by the branches in India of the British Medical Association.
42. "Drugs Consultative Committee," *Indian Journal of Pharmacy*, 10 (1948) 114. K. S. Grewal was on the Committee as representative of the East Punjab Government.
43. *Minutes of the First Meeting of the Drugs Consultative Committee*, 28 February and 1 March 1949, items 2 and 10.
44. *Pharmacopoeia of India (The Indian Pharmacopoeia)*, Ministry of Health, Government of India, Manager Publications, Delhi, 1955, p xiii.
45. *Indian Journal of Pharmacy*, 3 (1941) 34-35.
46. Dr B. Mukerji at the time was working as pharmacologist at the Biochemical Standardisation Laboratory, Calcutta. In the reference 42, his name is spelled as 'Mukherjee.'
47. Dr J. N. Ray had been Professor of Organic Chemistry at the University of the Panjab (1932-40) and was now Director of Production (Drugs and Dressings), Government of India.
48. *University of the Panjab Syndicate Proceedings*, 24 April 1942, item 13.
49. Dr Bashir Ahmad was Professor of Organic Chemistry at the University of the Panjab (1941-45); Dr Ahmad's involvement came at the time of drafting regulations for the B.Pharm. degree.
50. *University of the Panjab Syndicate Proceedings*, 8 May 1942, item 2.
51. *University of the Panjab Syndicate Proceedings*, 22 May 1942, item 3.

52. *University of the Panjab Syndicate Proceedings*, 15 February 1944, item 22.
53. *University of the Panjab Syndicate Proceedings*, 25 May 1944, item 37.
54. J. K. Bhatnagar, "We Remember Them," *Pharmacos* (Panjab University Pharmaceutical Society), 14 (1969) 3-10. Bhatnagar belonged to first batch of B.Pharm. graduates (1947) from the University of the Panjab.
55. P. L. Seth and N. C. Chaudhry, *personal communications*, received during early 1994. Seth and Chaudhry, also amongst the 1947 B.Pharm. graduates, attributed start of the course 'to the vision and personal initiative of Dr Grewal.'
56. The dispensary training continued to be a requirement for bachelor degree of pharmacy at the University of the Panjab, Lahore, and later at the Panjab University for around two decades. I myself went through it when I was student for B.Pharm. degree (1950) at the Panjab University. Later as per syllabi recommended by the All India Council for Technical Education the focus largely shifted to technology instructions.
57. H. Singh, "Pharmaceutical Education at the Panjab University," *Views and Reviews*, Association of Pharmaceutical Teachers of India, Bangalore, 2008, pp 603-613. The UIPS now has the top place for pharmaceutical education and research. It is the only institution in the country recognized by the University Grants Commission as Centre of Advanced Study in Pharmaceutical Sciences.