

## LIFE AND WORKS OF PURAN SINGH

H.S. VIRK

Department of Physics, Guru Nanak Dev University  
Amritsar-143005

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Puran Singh was the founder of chemistry of forest products in India. He was the first scientist from Punjab who got training in pharmaceutical chemistry from Tokyo University during 1900-03. He was a great genius who combined mysticism, vedantic philosophy, spiritualism and science. He worked at the Forest Research Institute (FRI), Dehradun, in the capacity of an Imperial Chemist and published 53 research reports, notes and papers in various journals in India and abroad dealing in diverse themes of chemistry of forest products. A brief account is given of his life and scientific works.

Modern science took roots in India only towards the end of the nineteenth century after the establishment of three universities at Calcutta, Madras and Bombay. Punjab under the Sikh rule had only traditional oriental schools known as Madrassas, Pāṭhśālās and Chatsals where students were taught classical Indian languages, grammar and rudimentary arithmetic. After the annexation of Punjab by the British, an Oriental College was set up at Lahore, which became the nucleus for Punjab University. However, teaching of science at B.Sc. (Hons.) and M.Sc. levels was introduced only during the first quarter of the twentieth century<sup>1</sup>. Despite these initial handicaps, Punjab produced a great mathematician of the status of Professor Rama Chandra and some eminent chemists, viz. Professor Puran Singh, Ruchi Ram Sahni and Dr. S.S. Bhatnagar. This article focuses on the life and works of Puran Singh, perhaps the first Punjabi chemist of eminence.

Professor Puran Singh<sup>2,3</sup> was born on 17 February 1881 in a small village, Salhad, District Abbotabad, now in Pakistan. He was a brilliant student and passed his F.A. examination in 1899 from D.A.V. College, Lahore. In 1900, he joined as a special student of pharmaceutical chemistry in Tokyo University, Japan. He was sponsored for higher studies not by any Maharaja, as was the common practice those days, but by the enlightened people of Rawalpindi. This was a rare gesture on the part of Sikh community to send abroad two young men for training in science and technology to promote industrial development of Punjab during the British period. Damodar Singh, Puran Singh's companion, was sponsored for training in glass technology and electrical engineering.

In Tokyo, Puran Singh studied Japanese and German languages, since the medium of instruction for science and technology was German. He returned to India in 1903 after successful completion of his higher training in Tokyo University. Puran Singh was a highly volatile and emotional young man. He

became a Buddhist monk in Japan and then a Vedantin after a chance encounter with Swami Ram Tirath who was on a lecture tour of Japan in February 1902. He organised an Indo-Japanese club in Tokyo and started a revolutionary journal "*Thundering Dawn*" to focus on the plight of Indian masses under the British rule. Puran Singh also met other Indian revolutionaries in Japan, for example, Kulkarni and Rama Kant Roy from Bengal. So, when Puran Singh landed in Calcutta, he was captured and imprisoned by the British. His parents got him released and took him to Lahore.



Professor Puran Singh (1881-1931)

There was hardly any opportunity for a foreign trained scientist in the early twentieth century Punjab. Puran Singh's parents were poor and burdened with the debt they owed to their community for providing funds for training of their son. To pay off the debt, he set up a manufacturing unit for the preparation of essential oils in Lahore in 1904. After a quarrel with his partners, he dismantled the unit and joined as Principal of Diamond Jubilee Hindu Technical School in Lahore. In November 1906, Puran Singh moved to Dehradun and set up a soap factory at Doiwala. This unit was later sold to a minister of Tehri-Garhwal state.

In April 1907, Puran Singh joined as Forest Chemist in the newly created Department of Chemistry of Forest Products in Forest Research Institute (FRI), Dehradun. He worked in FRI till 1918 and made significant contributions to research which were published mostly in *Indian Forester* and *Forest Bulletin*. Puran Singh was the founder head of Chemistry of Forest Products and took retirement on health grounds as Imperial Chemist of FRI, Dehradun. He became a member of the Chemical Society of Japan and the Royal Chemical Society of London. He published 53 research papers<sup>4</sup> and notes on various aspects of chemistry of forest products. A list of his published work is given in Appendix 1.

Professor Puran Singh's work can be classified into the following categories for the sake of discussion:

- (1) Studies on Essential Oils
- (2) Studies on Fats and Oils
- (3) Production of Tannins
- (4) Production of Drugs and Pharmaceuticals
- (5) Miscellaneous Research Activities

A brief review of his published work is given below.

*Studies on Essential Oils and Fats:* After his return from Tokyo, Puran Singh set up a distillation unit in the Anarkali bazar of Lahore for the preparation of essential oils from geranium and citrus oil. He had no sophisticated equipment at his disposal and utilized earthen pots and metallic vessels manufactured by local potters and blacksmiths. He achieved excellent results and the product was marketable. However, this enterprise failed, as the business partners could not pull together for long.

Puran Singh revived his interest in essential oils after joining FRI, Dehradun in 1908. Here, the environment was conducive for research and facilities were available for the promotion of his research projects. He worked on the isolation and analysis of essential oils from *Eucalyptus globulus*, khus, geranium, winter-green, sandalwood, and camphor oil. For distillation of camphor oil, a new condenser was developed by him.

Puran Singh was very keen to promote essential oil industry in India. He determined the oil values of forest oilseeds and suggested improved techniques for the extraction, distillation and clarification of turpentine oil from chir resin, *Pinus khasya*, *Pinus merkusii* and *Pinus excelsa*. He also prepared rosin from the oleoresin of *Pinus longifolia* and oleogum resin of *Boswellia serrata*. The medicinal use of essential oils was recommended by Puran Singh.

After his retirement from FRI, he devoted himself wholeheartedly to the promotion of essential oil cultivation and industry in India. Puran Singh was employed by Maharaja Scindia of Gwalior during 1919-23. He started cultivation of Rosha grass and *Eucalyptus globulus* in barren land. A factory was set up for the extraction of essential oil and the product was exported to England. The British Government was so impressed by his ingenuity and enterprise that Puran Singh was given 15 squares of land (*morabbas*) on lease in the district of Sheikhpura (Chak No. 73/19 near Nankana Sahib, now in Pakistan) for cultivation and export of Rosha grass. He left this project in 1928 when the whole crop was destroyed due to floods.

Puran Singh collected a variety of oilseeds of forest origin and estimated their fat and oil contents. He studied the oil value of sandalwood from South India and suggested improved methods of cultivation and extraction to promote the sandalwood oil industry.

*Production of Tannins:* Puran Singh took special interest in improving the quality and production of tannins in India. He published more than two dozen reports in *Indian Forester*, *Forest Bulletin* and *Indian Forest Memoirs* from 1908 to 1918. He made extensive survey of Indian forests from Himalayas to the eastern regions, including Bengal, Assam and Burma (which was part of India then).

In 1908, Puran Singh set up a laboratory for Chemistry of Forest Products in FRI from scratch and published three notes on the analysis of cutch and preparation of pure catechin, utilisation of khair forests for cutch and katha manufacture and preparation of Ngai camphor. Studies were carried out on tannins of Mangrove (*Rhizophora mucronata*), myrobalans, *Pistacia integerrima*, Arwal (*Cassia auriculata*) and walnut. Tannin extract was also prepared from barks of Indian oak, *Terminalia tomentosa*, and Panga fruits or Burmese myrobalans. Katha was prepared from dead wood of Acacia.

In India, tannins were estimated by local manufacturers using hide powder. Puran Singh introduced the use of freshly prepared nickel hydroxide for the analysis of tannin. He also studied the effect of addition of fat to the tannin extract and effect of storage on tanning materials.

*Studies on Drugs and Pharmaceuticals:* Puran Singh specialised in pharmaceutical chemistry from Tokyo University in 1903. He could not utilize

his talents and expertise in this field after joining FRI. However, he took keen interest in the cultivation of drug-yielding plants in Indian forests. A report was published in *Indian Forester* during 1913 highlighting this aspect. Camphor content of *Cinnamomum camphora* grown at Dehradun was determined. Therapeutic value of some essential oils, e.g. sandalwood and wintergreen, was assessed by Puran Singh and their use in drug manufacture was recommended. He also studied the effect of mineral salts as fish poison. He studied earth eating habits of the Indian deer and drew some conclusions about this tendency of Indian women during their pregnancy.

*Miscellaneous Research Activities:* Puran Singh carried out research investigations in various other fields. He initiated studies on the preparation of pure shellac and Burmese varnish. In 1910, he reported his results on analytical constants of shellac, lac, resin and lac wax in the *Journal of Chemical Society*. He carried out calorimetric tests on Indian woods, which proved to be of high scientific value. The composition of Ceara rubber from Coorg was determined by Puran Singh. He prepared wood-tar by destructive distillation of wood. A method for distinguishing powellised and unpowellised woods and a field test for the identification of paraffin in bees wax were developed by Puran Singh. Along with R.S. Pearson, he prepared charcoal briquettes from Indian woods in 1918, a technique now being revived by scientists of IIT, New Delhi under a programme on efficient use of fuelwood.

Puran Singh worked as a Sugar Chemist in the sugar factory of Sir Sundar Singh Majithia in Sardarshahr near Gorakhpur during 1923-25. He patented a novel technique for cleaning and decoloration of crystal sugar from raw sugar. This technique became very popular in Indian sugar industry, as it did away with the use of bone charcoal, which was disliked by all Indians in general, and the Brahmins in particular. Puran Singh had no research facility and approach to scientific journals during this period. It was his genius to invent a new technique in an entirely new field for which he received great appreciation from Indian fellow chemists at the Indian Science Congress session held at B.H.U., Varanasi.

Punjabi University, Patiala, has published recently all the literary works of Professor Puran Singh which run into two dozen volumes in English, Punjabi and Hindi. He was a great mystic poet and interpreter of Sikh scriptures. He was a great visionary who predicted the fall of communism and break up of Soviet Union<sup>5</sup>. His writings have much relevance to the present Punjab crisis and provide some unique insights for finding solution to the problem<sup>6</sup>. Puran Singh aspired for a Nobel Prize in literature<sup>7</sup>. He died on 31 March 1931 in Dehradun at the age of 50. He was a scientist by training and profession. Unfortunately, no attempt has been made so far to evaluate his scientific contributions, though he was a founder of Chemistry of Forest Products in India.

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