Professor Puran Singh (1881–1931): Founder of chemistry of forest products in India

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Early life

Professor Puran Singh 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. (equivalent to 10 + 2) examination in 1899 from DAV College, Lahore. In 1900, he joined as a special student of pharmaceutical chemistry in Tokyo University, Japan. He was sponsored for higher studies neither by the British-Indian Government nor by any Maharaja or Nawab of Indian state, as was the common practice those days, but by the enlightened elite of Rawalpindi town in Punjab. This was rare and unique gesture on the part of the Sikh community to pool together resources to send abroad two young Sikh boys, Damodar Singh and Puran Singh, for higher training in science and technology to promote industrial development of Punjab during the British rule. Damodar Singh was selected for electrical engineering and Puran Singh for chemistry and glass technology.

In Tokyo University, Puran Singh registered himself as a special diploma student in pharmaceutical chemistry. He studied both German and Japanese languages, as the medium of instruction for science and technology was German in Japan in those days. Puran Singh was a highly volatile and emotional young man. First he became a Buddhist monk while on the rolls of Tokyo University in Japan and then a Vedantin after a chance encounter with Swami Rama Tirtha, who was on a lecture tour of Japan in February 1902. He organized an Indo-Japanese club in Tokyo and started a revolutionary journal *Thundering Dawn* to focus on the plight of Indian masses under the British imperialism. Puran Singh also met other Indian revolutionaries in Japan, for example, Kulkarni from Pune and Rama Kant Roy from Bengal. So, when Puran Singh returned to India in September 1903 he was captured and imprisoned by the British after he landed in Calcutta. His parents got him released and took him to Lahore.

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 his training in Japan. To pay off the debt, he set up a distillation plant for the preparation of essential oils in Anarkali bazar of Lahore in 1904. After some quarrel with his financiers, he dismantled the manufacturing unit and

joined as Principal of Diamond Jubilee Hindu Technical School in Lahore. In 1906 he moved to Dehradun and set up a soap factory at Doiwala. This unit was later sold to a minister of Tehri-Garhwal state.

Research work at Dehradun

In April 1907, Puran Singh joined as a forest chemist in the newly created department of Chemistry of Forest Products (CFP) in Forest Research Institute (FRI), Dehradun. He worked there till 1918 and made significant original contributions to research, which were published mostly in *Indian Forester* and *Forest Bulletin of FRI*. He published 53 research papers and reports on various aspects of CFP. The British Government held an enquiry into his involvement in activities of Punjabi and Bengali revolutionaries, who took refuge in Dehradun. Fortunately, he came out unscathed in this enquiry, but he took voluntary retirement on health grounds as Imperial Chemist of FRI, Dehradun.

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

Studies on essential oils and fats

After his return from Tokyo, Puran Singh set up a distillation plant in Lahore for preparation of essential oils, viz. geranium oil and citrus oil. He had no sophisticated equipment in Lahore and utilized earthen pots and metallic vessels available with local potters and blacksmiths. He achieved success in his mission and the product was marketable in Lahore and London. However, this enterprise failed, as the business partners could not pull together for long.

After joining FRI in 1908, Puran Singh started his research activity in this domain. He worked on the isolation and analysis of essential oils from *Eucalyptus globulus*, khus, geranium, winter-green, sandalwood and camphor. For distillation of camphor oil, a new condenser was designed and developed by him. He collected a variety of oilseeds of forest origin and estimated their fat and oil contents. He studied the oil value of sandalwood grown in the then Madras state and suggested improved methods of cultivation and extraction to promote the sandalwood oil industry.

After his retirement from FRI, he devoted himself to the promotion of essential oil cultivation and its industrial production in India for export purposes. Puran Singh was employed by Maharaja Scindia of Gwalior during 1919–23. He started cultivation of Rosha grass (geranium) and *E. globulus* in the barren lands of the state and set up a factory to extract oil, which was marketed in India and exported to England by 'Volkart

Brothers'. The British Govt was so impressed by his ingenuity and enterprise that Puran Singh was offered 15 squares of land (*morabbas*) on lease in the district of Sheikhupura (now in Pakistan) for cultivation of Rosha grass for extraction of *motia* oil. He extracted terpentine oil from *Pinus khasya*, *Pinus excelsa* and *Pinus merkusii* and recommended the medicinal use of essential oils.

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 on tannins in *Indian Forester*, *Forest Bulletin* and *Indian Forest Memoirs*. He made an extensive survey of Indian forests from the Himalaya to Nilgiris and identified various plant varieties for extraction of tannin. Studies were carried out on tannins of mangrove (*Rhizophora muocranata*), myrobalans, Arwal (*Cassia auriculata*), Indian oak and walnut. *Katha* was manufactured from khair forests and 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 tannin extract and the effect of storage on tanning materials.

Studies on drugs and pharmaceuticals

Puran Singh specialized in pharmaceutical chemistry from Tokyo University in 1903 and his interest continued 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 FRI, Dehradun was determined. Therapeutic value of some essential oils, e.g. sandalwood and wintergreen, was assessed by Puran Singh. He also studied the effect of mineral salts as fish poison. He studied the earth-eating habits of Indian deer and drew some conclusions about this tendency of Indian women during their pregnancy.

Miscellaneous research activities

Puran Singh carried out his investigations in various fields. He reported his results on analytical constants of shellac, lac, resin, catechin and lac wax in the *Journal of Chemical Society* during 1910. He carried out calorimetric tests on Indian woods, which proved to be of high scientific value. He prepared wood-tar and determined composition of *cearra* rubber from Coorg state. Along with R. S. Pearson, he prepared charcoal briquettes from Indian woods in 1918, a technique now 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 mills of Sir Sundar Singh Majithia in Sardarshahr near Gorakhpur during 1923–25. He patented a novel technique for decoloration of raw sugar without the use of bone charcoal, which was an anathema to the Indian Brahmin. Puran Singh had no research facility and approach to scientific journals during this period and it was an act of his genius to discover a new technique in sugar chemistry. He presented the report of his new discovery at the Indian Science Congress session held at BHU, Varanasi.

Puran Singh was critical of British policy of science and technology in India. In an open letter to Sir John Simon (of Simon Commission fame), he summed up his viewpoint which has relevance even today. 'Scientific research should never be departmental. It should be surrounded by the whole world's critical atmosphere where no third class mediocres be able to breathe. To make Imperial Departments of science and technology is immoral. Research should be handed over to the Universities in India.'

Puran Singh died at the relatively young age of 50 years on 31 March 1931 in Dehradun. He was a founder of chemistry of forest products in India. He set up essential oils industry in Punjab and created a research laboratory of CFP of international standards from scratch. He developed indigenous instruments for his research work and did not bother to import sophisticated equipment from Europe.

Puran Singh is acclaimed as a great mystic poet in Punjab. He is also called the Tagore of Punjab. He wrote more than three dozen books in Punjabi, Hindi and English. He was a trend-setter in Punjabi literature and tried his hand at poetry, prose, novel, drama, translation, criticism, scientific and religious essays. He was a great friend of Tagore, Iqbal and Raman. C. V. Raman used to stay with Puran Singh in Dehradun and he was called 'Raman of the Raman rays' in his household.

Punjabi University, Patiala has published all the literary works of Puran Singh. I wish FRI, Dehradun bring out a special volume to highlight the scientific contributions of Puran Singh.

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