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HISTORICAL NOTE

Prof. Puran Singh: The father of forest chemistry in India

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Abstract
Prof. Puran Singh (1881–1931), India's inaugural forest chemist, significantly advanced the extraction and commercialisation of essential oils at the Forest Research Institute, Dehradun. He pioneered the cultivation of Palmarosa grass and introduced steam distillation techniques, producing substantial quantities of essential oils, thereby establishing a foundation for India's essential oils industry. His notable innovations in sandalwood, eucalyptus, and turpentine oils garnered international recognition for their exceptional quality. Puran Singh's scientific rigour, demonstrated through journal publications and peer praise, exemplifies his ability to translate laboratory research into industrial applications within colonial constraints. Beyond his scientific achievements, he critiqued colonial governance in his research, advocating for autonomy and stronger industry-education links, as expressed in his testimony to the Indian Industrial Commission. This paper explores Puran Singh's legacy in research and literature, highlighting his challenge to colonial norms and his contributions to the development of indigenous science. His perspectives on institutional autonomy remain relevant to contemporary debates on STEM education and industrial research in India.

Keywords Puran Singh · Forest chemistry · Industrial commission of India · Colonialism · FRI

1 Life of Puran Singh

Puran Singh was born on February 17, 1881, in Salhadd, Abbottabad (now Pakistan). His father, S. Kartar Singh, was a *patwari*, and his pious mother, Parma Devi, instilled love and kindness in Puran Singh's mind and soul. He had two sisters, Lajan and Ganga. His early years in the beautiful Salhadd greatly influenced him, shaping his love for nature, animals, rivers, and mountains, though it worried his mother. After matriculation, he attended D.A.V. College, Lahore, where his teacher, Bhagat Gokal Chand, encouraged him to pursue science in Japan. So Puran Singh left college midway and sailed from Bombay to Japan with Damador Singh. The ship stopped in Hong Kong, where Puran Singh delivered his first lecture at the Gurdwara. Damador Singh, calm and disciplined, met Puran Singh's innocent requests with joy (Singh, 1983). In 1900, Puran Singh arrived in Japan to attend Tōkyō Imperial University, where he studied pharmaceutical sciences and garnered admiration for his literary and meditative nature. Under Prof. Nagai Nagayoshi, Japan's first renowned pharmaceutical researcher, Singh fell in love with Japan's natural beauty and civilisation. His oratory skills and humanitarian views attracted revolutionists like Ramakant Roy and K.D. Kulkarni, who appointed him secretary of the Indo-Japanese club. Encouraged by them, he wrote his first novel about revolutionists, though no copies have been found. An American friend's gift of Walt Whitman's *Leaves of Grass* deeply inspired him. During his time in Japan, he connected with influential figures such as Okakura Kakuzō and Kinza Hirai, enhancing his understanding of art, literature, and philosophy. Puran Singh travelled extensively for scientific research and industrial knowledge, even climbing Fujiyama, Japan's highest mountain. He attended and lectured at various events on art, literature, and religion, and some of his lectures were published in Japanese newspapers. After meeting with Swami Rama Tirtha, Puran Singh launched his journal, *Thundering Dawn*,

The late Prof. Puran Singh, Chief Chemist at the Forest Research Institute in Dehra Dun, realised that this industry had a future. He leased 400 acres of land and laid out a plantation near Lyallpur in 1924. He succeeded in establishing the grass over an area of 230 acres. He installed a Steam Distillation plant, and 3000 to 3500 pounds of Palmarosa oil were produced annually. This was the first example of cultivating an essential oil grass in India (Luthra 1942, p. 305).

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in Tōkyō in January 1903. His spiritual journey was intertwined with that of Swami Rama Tirtha, leading Puran Singh to often wear yellow robes and to contemplate becoming a *sanyāsī*. Damodar Singh, however, urged him to complete his training before deciding. This deep spiritual bond lasted until Swami Rama Tirtha's death in 1906. Later, in Gwalior, Puran Singh wrote a highly regarded biography of Swami Rama Tirtha. After marrying Maya Devi, Puran Singh lived in Lahore for a while, working in oil extraction from seeds and flowers. He later moved to Dehradun and became a chemical advisor at the Forest Research Institute (FRI). After 1913, he wrote essays, poetry, plays, novels, and translations in English and Punjabi, along with introductions, reviews, and critiques. He eventually resigned and began working in various states of India. He returned to Dehradun and lived there until his death. In his final days, Dr Balbir Singh and Dr Khudadad, close friends, cared for him in his battle with galloping phthisis, which was ultimately in vain; he passed away on March 31, 1931 (Singh, 2013, 2016, 2023a, 2025).

2 A scientist par excellence

> I have been working as Acting Imperial Forest Chemist from the year 1907 onwards, later as Chemical Adviser to the Forest Research Institute, Dehra Dun, till the year 1919 when I retired on invalid pension. My work at the Forest Research Institute from 1907 to 1919 was generally on forest industries and on the chemistry of Forest produce of all kinds. From its very inception, I had started and organised the Chemical section of the Institute and initiated the Chemical Research with a view of developing the Forest Industries. To mention a few, I played an important role in the manufacture of Essential oils in India, and I was the first to suggest the distillation of sandalwood oil in India. I suggested improvements in the distillation of Palmarosa grass oil, and in conjunction with the Forest Chemist, modern methods were demonstrated. On the Nilgiri hills, I developed the production of eucalyptus, geranium, and wintergreen oils. I worked on the manufacture of tannin extract in Burma and of turpentine and rosin in the United Provinces. The Government of India, in their resolution on the Annual Reports of the institute, was pleased to express its satisfaction with my work, I being the only Indian then on the Research staff (Singh, 2023b, p. 131).

The statement above is from Prof. Puran Singh, outlining his rigorous scientific research conducted over a short span of service. We will examine here Prof. Puran Singh's professional attitude, scientific research capacity, temperament, vision for industrial development and research in India, and a critical analysis of existing colonial policies regarding education, scientific research, and the political landscape of higher education. His insights and forecasts concerning scientific research, objectives, and the establishment of research institutes and universities in India remain vital even today. After resigning from the Hindu Technical Institute in Lahore in 1906, Puran Singh opened a soap factory in Doi Wala, Dehradun. In April 1907, he joined the Forest Research Institute (FRI) in Dehradun as a Forest Chemist (later renamed Chemical Advisor). He was a pioneer in the history of industrial and chemical research in modern India, publishing extensively on chemical science and earning a strong reputation as a scientist. Copies of 53 published research notes, reports, and papers by Puran Singh are available at FRI, Dehradun (Virk, 1993). Puran Singh was also a member of *The Chemical Society* in London and *The Pharmaceutical and Chemical Society of Japan.* His expertise encompassed grasses, Indian oil plants, and oil extraction and distillation. Pearson (1917), Pilgrim (1919), Simonsen & Rau (1922), Rao et al. (1925), Pal (1930), Narielwala & Rakshit (1946), Raminder Singh (1972), Visvanathan (1985) and Virk (1993, 1998 and 2008) provide glimpses of his efficiency in science and contributions to the fields of oil extraction and distillation. Narielwala and Rakshit rightly observe that Puran Singh was not only a pioneering scientist in the laboratories of the Forest Research Institute in Dehradun but also adept at translating his experimental research into practical applications by successfully cultivating Rosha grass. However, he faced many difficulties in doing so. Additionally, they discuss how Puran Singh's experiments serve as an essential model that the Government of Punjab should reconsider. Narielwala and Rakshit (1946, pp. 20–21) note:

> The late Mr Puran Singh introduced the grass in the Punjab and started a model plantation on a cottage industry basis. The grass is known to have been used in India from ancient times, and until recently, India was the only source of this oil...The late Mr. Puran Singh, realising the importance of this oil for the perfumery industry, persuaded the Punjab Government to give him a grant of land for the experimental cultivation of Palmarosa grass.

Puran Singh's passion for his work is commendable, and he would never refrain from undertaking any adventure, even if the risks involved were too high. In the history of extracting essential oil from *Blumea Malconiii* in India, Simonsen and Rau (1922, p. 876) note that "preliminary experiments made in the field in 1915 by Mr Puran Singh showed that the herb on distillation in steam yielded about 0.26 per cent of an oil which resembled caraway-seed oil in smell, but was somewhat milder." In India, research and study in forestry were new. Of course, like other disciplines,

it was introduced by Western scientists through their own types of scientific experiments, which were unfamiliar to Indian natives. Satpal Sangwan (1999, p. 210) observes that "others, like one Chajju Singh, who passed the exams, later abandoned the career of a Forester mainly because they found the forest life 'too hard and too hazardous'. The only notable exception was Puran Singh, who joined the Forest Research Institute at Dehra Dun in 1907 as Forest Chemist." Some American newspapers, such as *The Bamberg Herald* (6 November, 1919), *The Hays Free Press* (12 February, 1920), and *The Watchman and Southron* (5 May, 1920), published a column under the title of "New Source of Turpentine" and mentioned:

> Tree in Central India to be looked to for supply of really good quality: Turpentine oil and rosin are already being produced on a commercial scale in India by the distillation of pine rosin. A new source of supply which, though comparatively small may be valuable, especially for Indian use, has now been found in frankincense or olibanum. This material is obtained by natives by making incisions into the stems of *Boswellia serrata*, a tree widely distributed throughout the dry-zone forests of Central India. The resinous substance which exudes from the cuts contains a kind of turpentine. a rosin and a gum. Investigations of the methods of separating these constituents in a marketable form have been conducted since 1912 by the forest authorities in India in co-operation with the Imperial Institute, and the results have been published recently in a paper by R. S. Pearson, forest economist, and Puran Singh, chemical adviser, at the Forest Research Institute, Dehra Dun. The general conclusion reached, based on the results of numerous trials, is that the turpentine oil is equal to good-quality American turpentine oil.

Commerce[1] published a special article titled "Eucalyptus in India: Successful introduction trials" that analyses scientific research and notes that Puran Singh, a forest chemical expert from Gwalior State, made significant contributions to understanding the eucalyptus oil industry in India through his exhaustive 1915 study in the Nigiris. His research concluded that the region's annual production of 24,000 pounds of eucalyptus oil could not be expanded without increasing the cultivated area of eucalyptus trees. This insight highlighted a critical bottleneck in scaling production, namely the link between industrial output and agricultural expansion. His findings underscored the need to expand plantations to enhance competitiveness, particularly against imported oils, and informed discussions on pricing strategies to make Indian oil viable in markets such as Bombay and Calcutta. Singh's work emphasised the interdependence of cultivation scale and industrial growth, shaping early 20th-century efforts to optimise India's eucalyptus oil potential.

3 Industrial commission of India 1916–18

In May 1916, the Government of India appointed the *Indian Industrial Commission*, under the presidency of Sir T. H. Holland, which was "instructed to examine and report upon the possibilities of further industrial development in India" (Report 1918, P. XV). The Commission, along with its members, visited various locations in India to evaluate industrial projects and their research works. The Commission visited the Forest Research Institute in Dehradun, where Puran Singh presented his written representation, which was published in the *Minutes of Evidence*.[2] Taking full responsibility for his words, Puran Singh discussed his training and understanding of science, the challenges of scientific research in India, and suggestions for developing the indigenous industry in this letter. In his opening remarks, he explained his pharmaceutical training at the Tōkyō Imperial University in Japan. Furthermore, he addresses the various challenges faced in scientific research in India and the lack of connections between scientific research and industry. Finally, he provided key suggestions for the future development of scientific research and industry in India. He was highly critical of colonial governance and its attitude toward scientific research in public and private institutions, including colleges and universities. He identifies fundamental defects in India's overall system of scientific research and industrial development. Puran Singh (1919) notes in MOE that science cannot be popularised if the Government, as an official administration, commands. Only universities that cultivate the "light of knowledge" can do this because of their personal affection for people. "The work of the university professor, unlike that of the Government official, is open to public criticism and valuation not only at the hands of laymen, but before the other Universities of the world." Thus, a professor's work is not limited to the self but is devoted to the university's high standards, whereas an official's work is very limited in satisfying the bureaucracy. In most cases in this country, fresh people from various universities are not getting positions of responsibility in research and education. Research work by any Government agency does not carry weight in the scientific bodies of the world. Research is the most effective means of educating people across various streams, and it

[1] Eucalyptus in India: Successful introduction trials, *Commerce,* June 17, 1922.

[2] Minutes of evidence: Taken before the Indian Industrial Commission*, 1916–18* (Vol. 5). His Majesty's Stationery Office, 1919.

functions properly in universities, not in Government departments. Recently, the growth of institutions focusing on people and Government assistance has begun to rise. Education in colleges run by Government departments is not inclined towards efficiency. Finally, Puran Singh says:

> ... it is a fact that no country in the world has followed the procedure adopted in this country for organising scientific and industrial research. This point is well illustrated in a recent number of "Nature" by Mr Hugh Robert Mill in reviewing "A Note on an Enquiry by the Government of India into the relations between Forests and Atmospheric and Soil Moisture":— He says:- "To our mind the method adopted could produce no better result than it appears to have done. In a scientific problem, such as was set forth, the only function of the State seems to us to be to decide that such an enquiry shall be carried out at the public expense and that every facility for obtaining data shall be given by all the departments and all the Government concerns, local and central. It should then be handed over to a competent man of science, set free from all other duties and supplied with necessary systems. His report, when complete, would be authoritative and epoch-making, if not final, and, incidentally, his own reputation would be made or marred by his handling of the facts. The total expense would probably be no greater, and the labour of many public servants would not be diverted from the work for which they were trained." This comment emphasises exactly the point I am attempting to bring to your notice, *viz*., that scientific research must be independent and in the hands of the best possible men. I know, under present conditions, that scientific research cannot be very well affiliated with the Indian Universities, whose graduates are at present received by the foreign Universities as matriculates only, a fact which shows that the standard of scientific education in Indian Universities is very low. (pp. 789-90)

While discussing the scientific research approaches of Europe, America, and Asia, he strongly argued for granting autonomy to research, researchers, and educational institutions, including colleges and universities. He made strong recommendations for advancing scientific research and developing the industry. Puran Singh proposes establishing a robust, well-funded university of science, a science syndicate, and a science council. He formulated a model for coordination between research, government, industry, and business. Quoting his research, he identifies how various kinds of seeds, flowers, and plants are available in India for oil distillation. Furthermore, he suggested the need to hire experts from different countries, recruit capable individuals for syndicates and councils of educational institutes, select students from across the country for various areas of scientific research, and enhance the applicability of research to industry, among others.

Ironically, for all his words of wisdom and valuable suggestions, the scientific fraternity, while evaluating the development of industrial research in India by Visvanathan (1985), mentions his name in an appendix and instead highlights the name of another renowned nationalist, Pandit Madan Mohan Malviya, who was a member of the Commission but not a scientist himself. Pandit Madan Mohan Malaviya, being a member, was part of the Indian Industrial Commission (1916–18) and visited various institutions and industries with this Commission. In the report of this Commission, he, submitted a detailed note in which he acknowledged that “in the note, submitted to us by Mr Puran Singh, of the Dehra Dun Forest Research Institute, he has put forward a strong argument against research under the control of an administrative officer. The considerations urged by him merit attention.”[3]

4 Colonial backlash, conspiracy and recognition

Puran Singh’s dissent was a powerful critique of the colonial policy of scientific education and research in India. Somehow, the Patiala state requested that the British Government appoint a scientist to their State, so Puran Singh was transferred to Patiala for a year. Within three months of joining Patiala, he returned to Dehradun on medical leave and never went back. In the meantime, the British Government appointed a British chemist as the chemical adviser at FRI, Dehradun, which politically complicated Puran Singh’s service matters, including leave, pay, and related issues (Singh, 2023b). Now, if Puran Singh rejoined FRI, he would have to work under the supervision of the British chemist adviser. He felt humiliated and ultimately, submitted his resignation. At this time, he was also suffering from gout and albuminuria. The Forest Chemical Department felt both morally and administratively at a loss following Puran Singh’s departure.

Upon establishing the Chemical Section at FRI, he initiated large-scale research on forest products and developed industries for essential oils (sandalwood, palmarosa, eucalyptus, geranium, wintergreen), tannin extracts, turpentine, and rosin. His innovations, such as improved distillation methods and processes for turpentine redistillation, were adopted in government plants and praised by other scientists of the time. Earlier in Japan, he launched citric acid production at Osaka Chemical Works and worked on alkaloids and rubber. After retirement, he organised Gwalior’s

[3] *Report of the Indian Industrial Commission*, 1916–1918, Superintendent Government Printing, 1918, p. 345.

Chemical Department, building a modern lab and distillery and cultivating raw materials that led to the commercial production of thymol, cumin oil, and anethi oil, earning acclaim in London markets. He also contributed to the founding of the Bengal Soap Factory and developed an improved process for producing white sugar, demonstrating sustained leadership in industrial chemistry across multiple Indian states. In recognition of his valuable contribution, the Forest Research Institute, Dehradun, mentions in its *Golden Jubilee Souvenir*[4]:

> 1906-1919− True foundations of the Forest Chemistry were laid during the period by the first and foremost Branch Officer, Shri Puran Singh, the famous poet laureate of the Punjab. Great credit is due to his herculean efforts and the intense chemical activity in diverse fields of chemistry, harnessed to the service of Forestry in India. Conventions established since then have always acted as the lifeblood of the Branch's chemical work...As a consequence of this great development, India has now become not only self-sufficient for her requirements in respect of turpentine, rosin, and sandalwood oil, but has also established an ever-expanding export trade.

5 Summing up

In the field of forest chemistry in India, Puran Singh is considered the father of forest chemistry, having established a strong department at FRI, Dehradun. With his enthusiasm and energy, he not only published research findings but also made remarkable contributions to the field, inspiring other young researchers to pursue careers in this domain. Puran Singh was a visionary scientist who was thinking about the independence of scientific research from the colonial framework. So, he not only critiqued colonial policies on education in India but also put forward a futuristic vision for the study and research of science and its applied mechanisms, tailored to the needs of the Indian people. Unfortunately, his name has been consistently omitted from the history of Indian science and from the curriculum.

Declarations

Conflict of interest The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

[4] *Golden Jubilee Souvenir, 1906–1956*. Forest Research Institute and Colleges, 1956, pp. 77–78.

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