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Professor Shyam Bahadur Saksena Birth Centennial Year Tribute

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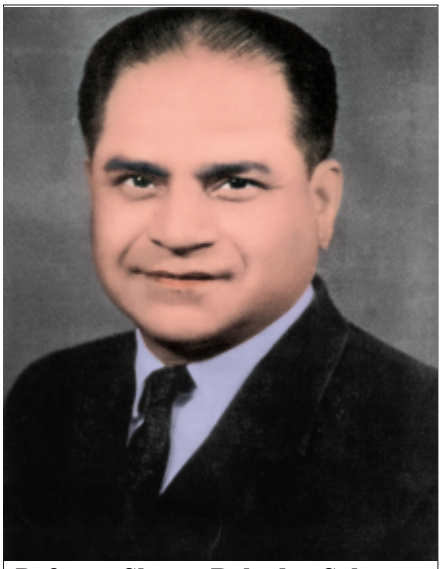
It is customary in our country at least, to memorialize a person on the anniversary of some important event in his career. The year 2017 marks the centennial year of the birth of late Professor Shyam Bahadur Saksena who was born on 10th August 1917 at Jabalpur in the then Central Provinces and Berar. It is in the fitness of things that Mycological Society of India decided to commemorate the centennial year by dedicating the KAVAKA being Transactions of Mycological Society of India Volume 48(2) of the year 2017 as the commemoration volume marking the centenary year of his birth. Before we write anything further we would like to thank the Editor-in-Chief of the journal "Kavaka", Professor N.S. Atri for inviting us to write about the life and scientific work of late Professor Shyam Bahadur Saksena. Dr. Saksena was a mycologist of international fame. It is indeed a rare honour and privilege to do so.



Pofessor Shyam Bahadur Saksena
(10-08-1917 to 21-03-1988)

EARLY LIFE

As already indicated Professor Saksena was born on 10th August 1917 in the beautiful town Jabalpur in the Central Provinces and Berar (now Madhya Pradesh). His father, late Munshi Ram Gulam Saksena was at that time an Inspector in the Excise Department, so he was sent to a municipal school at Laskar, Gwalior. His mother, Smt. Rama Devi Saksena passed away in 1925, when young Shyam Bahadur was only 8 years old. Shyam Bahadur passed his Intermediate Examination from Victoria College, Gwalior. He passed his B.Sc. Examination from the same college under the auspices of Agra University, with first division and secured first position among the Biology students of his college. His teachers and others encouraged him to join Agra College, Agra for his M.Sc. (Botany) degree under the supervision of late Professor K.C. Mehta who was a noted world authority on rusts in our country. After doing his M.Sc. in Botany from Agra College, Agra in 1939 in first division with first position, he joined the Department of Agriculture, Govt. of Gwalior state in 1939 as a Research Botanist and remained in that position till 1948. He was married to Mrs. Sarla Saksena in the year 1939, who was the daughter of late Mr. Gopal Sahai, who was the I.G. Police of Bhind district of Gwalior State.

PROFESSIONAL CAREER -THE BEGINNING

Saksena was offered a lecturership in Sagar University, Sagar (now Sir Hari Singh Gour Central University, Sagar) in the year 1948 after receiving a letter of appointment from the founder Vice Chancellor Sir Hari Singh Gour. At that time appointment of lecturers was done without interviews, of course applications were invited for the posts. Dr. Saksena who was not a Ph.D. at that time selected the area for his Ph.D. work a part of the forest neighboring Sagar town on the eastern side of which is known as Patharia Forest. Formerly initially Sagar University was situated near Makronia village in the barracks with asbestos roofing. Patharia forest was previously studied by Misra and Joshi (1952) with respect to higher vegetation. They collected general data on climate, geology, soil characteristics, physiographic and biotic plant communities recognized by them. In an epoch making paper entitled, "Ecological factors governing the distribution of soil microfungi in some forest soils of Sagar" published in the Journal of Indian Botanical Society Vol. XXXIV(3) 262-298,1955, Saksena made the first attempt of analyzing the distribution of microfungi in the world analogous to the study of higher vegetation of plants. For studying the soil fungi serial dilutions of soil were plated in petri dishes on suitable media. Each petri dish was treated as a unit of study and analogous to a quadrate in a forest. Dominance was not calculated for obvious reason in case of fungi while acknowledging late Professor Saksena remembered Dr. R.K Saksena of the University of Allahabad under whose guidance this work was done, he gratefully acknowledged late Prof. R Misra, Head of the Department of Botany, University of Sagar, Sagar. He expressed his thanks to Dr. K.K Bhatia, a Ph.D. student of Professor R. Misra who helped him in the field work with respect to higher vegetation. Bhatia was a brilliant scholar but unfortunately, he died very young at Cambridge in U.K where he had gone for higher studies. It was in 1953 when Dr. Saksena was working on ecology of soil fungi of local forest, found some isolates of fungi that did not sporulate and he was quite puzzled about one of them. Saksena had narrated a story in detail in his presidential address to the Botany Section of the Indian Science Congress in the year 1979 at Hyderabad.

SCIENTIFIC CONTRIBUTIONS

We would like to quote a paragraph or so of late Prof. C.V. Subramanian's article perhaps his last entitled, "**The Pursuit of Mycology in the Tropics: Recollections**" published in the year 2015 in the journal "Kavaka" (Subramanian, 2015). We quote, "As already mentioned, the soil is a great reservoir of fungi in which novelties abound, and the temptation to cite yet

more examples persists. One of the most loveable and respected among my friends was S.B. Saksena who led an active school of research in the Sagar University, Sagar in Madhya Pradesh, India. Saksena worked on soil fungi and one of his early discoveries was a most interesting Zygomycete, the group to which common bread mould, *Rhizopus* belongs. Saksena's fungus was beautiful and unique. It had solitary flask shaped sporangia, each with a long neck and a columella and rhizoids subtending from sporangium. It could not be accommodated in any known genera, and Saksena erected the genus *Saksenaea* for in honour of his teacher (Ph.D. supervisor), Prof. Ram Kumar Saksena of Allahabad University, Allahabad and the fungus itself was called *Saksenaea vasiformis*, from the flask shaped sporangia. Dr.Saksena narrated in his presidential address delivered at Hyderabad in the year 1979 how the culture remained sterile for months, in his hopelessness, it dawned on him to bait it in water and the fungus dramatically produced vesicular sporangia. Later work showed that it had worldwide distribution and yet a sexual stage is not yet known. On the other hand it has been shown to be a pathogen and the cause of disease in humans (Ajello *et al.*, 1976)."

From 1976 to 2016, a large number of reports have come from different parts of the world. Till 2010 it was believed that *Saksenaea vasiformis* is a monotypic genus. However, in 2010 Alvarej *et al*. published a paper entitled "Molecular phylogeny and proposal of two new species of the emerging pathogenic fungus *Saksenaea*" in the Journal of Clinical Microbiology, December 2010 Vol. 48 No. 12 pages 4410 to 4416 through a polyphasic study based on analysis and sequences of the Internal Transcribed Spacer (ITS) region, domains D_1 and D_2 of the 28SrRNA gene and the elongation factor1α (EF-1α) genes as well as by evaluation of the relevant morphological and physiological characteristics of a set of species collected from different culture collections of the world and demonstrated that *Saksenaea vasiformis* is a complex of species and proposed 2 new species of *Saksenaea* viz. *S. erythrospora* and *S. oblongispora*. We propose to discuss this aspect of the two new species in somewhat greater details in separate article in this journal "Kavaka" entitled " ***Saksenaea vasiformis*** **revisited after 64 years**" certain new aspects in view of recent discoveries.

Since its first discovery as human pathogen, this Zygomycetous pathogen has been reported from different parts of the world. It has also been reported from soil samples of different parts of the world as human and animal pathogen. Infection can be rhino-cerebral, cutaneous or subcutaneous, or disseminated (osteroarticular or pulmonary). Infection from contaminated catheters has also been reported. Infection can also be transmitted through the bite of scorpion sting. In addition *S. vasiformis* has been reported to infect the killer whale, Pacific white sided dolphins and bottlenose dolphins in captivity (Robeck and Dalton, 2002). Its medical importance has prompted continued study, and the uniqueness of the fungus in the *Zygomycetes* won for its placement in a separate family *Saksenaeaceae* (Ellis and Hesseltine, 1974). Vega *et al* (2006) and Kaushik *et al.* (2012) have given in a tabular form the cases of human infection in the world and India up to that period

Prof. Saksena discovered another two new genera *Gliocladiopsis* with the species *G. sagariensis* and *Monocillium* with its species *M. indicum*. The genus *Gliocladiopsis* was introduced by Saksena (1954) based on *G. sagariensis* to accommodate a fungal isolate from soil that had penicillate conidiophores resembling *Penicillium* and *Gliocladium*. Saksena (1954) distinguished *Gliocladiopsis sagariensis* from *Penicillium* and *Gliocladium* based on morphological differences in conidium and conidiogenous morphology and the apparent lack of chlamydospore formation in culture. Agnihothrudu (1959), however was able to observe chlamydospores formation in culture and based on this as well as morphological similarities synonymies *Gliocladiopsis sagariensis* under *Cylindrocarpon tenue* (Bugnicourt, 1939). In contrast Barron (1968) considered *Gliocladiopsi*s as a later synonym of *Calonectria* (as *Cylindrocladium*). However, Lombard and Crous (2012) based on multigene phylogeny, reinstated *Gliocladiopsis sagariensis* as the type species for the genus. In the 10th edition of the Dictionary of the Fungi by Kirk *et al.,* (2008) *Gliocladium* is a valid genus recognized.

The other genus *Monocillium* with its species *indicum* was discovered in the year 1955 (Saksena, 1955a) is also recognized as a valid genus in Dictionary of the Fungi, 10th edition. Saksena discovered a new species of *Paecilomyces,* namely *P. fusisporous* in 1953 from Patharia forest soils. This new species had very characteristic fusiform or top shaped conidia. Samson and Mahmood (1970) however, named the fungus as *Acrophialospora fusispora* (Saksena) Samson [Synonyms *Acrophialospora nainiana* Edward (Edward, 1959); *Massoniella indica* M.A. Salam & P. Rama Rao (Salam and Rama Rao,1960); *Paecilomyces fusisporous* S.B. Saksena (Saksena, 1953)]. Saksena in 1955 described another new species of *Cephalosporium* as *C. roseogriseum* from soil (Saksena, 1955b), the mycoparasitic behavior of fungus was shown by Chaturvedi and Dwivedi (1982). Another new species reported by Professor Saksena (Saksena, 1965) was *Sporothrix albicans* which was later thought to be synonymous with *Sporothrix schenckii*. When Saksena was doing excellent work in the taxonomical and ecological studies on soil fungi at Sagar, Late Prof. R. Misra who moved to Banaras Hindu University, Varanasi encouraged Dr. R.Y Roy and Later Prof. R.S Dwivedi to initiate similar type of work in the grassland soils of Varanasi.

In 1958, Prof. Saksena left on a sabbatical leave to work with Professor S.D. Garrett of the University of Cambridge on certain aspects of the fungus *Trichoderma viride* in soil. Here also we would like to quote the paragraph of an article which Late Professor S.D. Garrett, FRS of the Botany School, Cambridge wrote in the Festschrift Volume in 1978 and we thought nothing can give better appreciation of the scholarly achievements of late Professor Saksena than the quotation which was given in the INSA memoir Volume 17. Professor Garrett wrote, "It is a privilege to have been invited to contribute to the Festschrift Volume of essays assembled in honour of Professor Saksena in recognition of his

international standing as a mycologist. The writing of this article has been a pleasure for me, because for many years Professor Saksena and I have shared an interest in soil fungi, including pathogenic root infecting fungi. This is why he was an honoured guest, for the academic year 1958-1959, in our sub- department of Mycology and Plant Pathology at the Cambridge Botany School. Unlike me, however, Professor Saksena has the further distinctions of being an internationally known authority on the taxonomy of soil fungi to which he has added several new genera and species. This taxonomic competence was an essential ingredient of his distinguished early studies on the synecology of the Indian soil mycoflora."

The first to register for a Ph.D. programme with Prof. S.B Saksena was Dr. M.R. Siddiqui who did his associateship from IARI New Delhi and joined Prof. Saksena as Ph.D. scholar who did excellent work on the monographic studies on the genus *Alternaria*. Siddiqui later retired as Professor and Project Coordinator Division of Seed Science and Technology, IARI, New Delhi. The senior author was the second to get his Ph.D. degree with Dr. S.B. Saksena in the year 1961. Dr.S.B Saksena was very much concerned with the foot rot and leaf blight disease of *Piper betle* (pan) cultivators in Madhya Pradesh including Sagar. S.B Saksena wanted this problem of foot rot and leaf rot of Pan to be investigated thoroughly and therefore, the problem was given to R.S. Mehrotra. Dr. S.B Saksena left for a year on sabbatical leave to work with Professor S.D Garrett. Professor S.D Garrett at Cambridge asked Dr. Saksena to investigate the reasons as to why *Trichoderma* fungus becomes a dominant colonizer of fumigated soils. Saksena working with a simple apparatus of Evan's Tubes successfully demonstrated in an excellent paper published in the Translocations of the British Mycological Society in 1960. Saksena proposed that the success of *T. viride* in fumigated soils was due to its combination of a moderate but sufficient degree of fumigant tolerance with a high degree of growth rate through the soil when the fumigant was dispersing through the soil and this interpretation of the data made a significant advancement of our understanding the problem of dominance of *T. viride* in fumigated soils.

On return from Cambridge Professor Saksena gave this problem to one of his Ph.D. students Dr. K. Lily who wanted to know whether the hypothesis propounded by him at Cambridge holds good for soils at Sagar where the soils are generally alkaline. Lilly (1967) working with alkaline soils showed that the role of *Penicillium nigricans* parallels with that of *Trichoderma viride*. On his return from Cambridge, Prof. Saksena became interested in biological control of soil borne plant pathogens and quite a number of his students in his laboratory worked on the biological control of soil borne plant pathogens. Interest of Professor Saksena diversified from soil fungi to soil borne plant pathogens, aquatic fungi, and leaf litter decomposing fungi, the dermatophytes and the post-harvest pathogens, the rhizosphere and rhizoplane studies of several crop plants, phyllosphere studies, root nodule bacteria, soil fungistasis, aquatic fungi, monographic study of *Penicillium* species and several others. A strong school of Mycology and Plant Pathology was thus established by Late Prof. S.B Saksena. The leaf rot and foot rot of Pan (*Piper betle*) and the role of cuttings of Pan and survival of the pathogen in soil was worked out at Sagar University. Dr. D.P.Tiwari showed that the pathogen survives in the soil in the form of the chlamydospores, and isolated the pathogen by using the selective medium of Pimaricin, Vancomycin and PCNB. *Trichoderma viride* was utilized for controlling the disease. Another student of Professor Saksena, Late Dr. K.M. Vyas and his research associate later found that Streptomycin sulphate can be used for controlling *Phytophthora* on Pan. Professor Saksena was elected President of the Indian Phytopathological Society in the year 1975 and gave a very thought provoking address in the Bangalore session of the society. The title of his address was "*Phytophthora parasitica* the scourge of Pan (*Piper betle*)" in which the work done by his research associate and students was summarized. He made a fervent appeal for the establishment of Indian Pan Research Institute in the country.

Prof. Saksena published more than 100 research papers in national and international journals including Mycologia, Transactions of the British Mycological Society and Hydrobiologia. More than thirty students took their Ph.D. degree under his guidance and many of his students occupied professorial chairs in many universities of the country and other higher positions. R.S. Mehrotra was fortunate to be his M.Sc. student in the year 1956-1958 and worked on the coprophilous fungi of Sagar and later worked on the diseases of *Piper betle* and their control. His association lasted for about 15 years as he was appointed a lecturer (Assistant Professor) in the year 1962 and remained there till 6th September 1970 when he moved to Kurukshetra University as Reader, Head of the Department of Botany and later became Professor in 1978 from where he retired in January 1997.

AWARDS AND HONOURS

Dr. Saksena got Professorship in the year 1963 and continued in that position till 1977 when he retired from active service. Many honours came to Professor Saksena. He was elected Fellow of the Indian National Science Academy in 1971, President of the Indian Botanical Society in 1971, President of the Indian Phytopathological Society in 1975, President of Mycological Society of India 1978, and President Botany Section of the Indian Science Congress in the year 1979. He was a Fellow of the National Academy of Sciences, Allahabad. He was a Fellow/Member of the Mycological Society of America and British Mycological Society of Great Britain. Professor Saksena was looked upon by eminent Botanists of the country with respect.

CONTEMPORARY BOTANISTS

Some of his contemporary botanists and mycologists including Late Prof. K.S. Thind of Panjab University, Chandigarh, Late Prof. C.V. Subramanian of Madras University, Late Prof. B.M. Johri of Delhi University, Late Prof. Reyat Khan of Aligarh University, Late Prof. B.S. Mehrotra of Allahabad University, Late Prof. V. Puri of Meerut University, Late Prof. R.P. Roy of Patna University, Late Prof. K.S Bilgrami of Bhagalpur University, Late Prof. Dhyansagar of Nagpur University and several others recognized his contributions in the field of mycology with

respect. Besides being contemporaries, they formed a core group of his friendly and academic circle. Late Prof. L.P. Mall of Vikram University, Ujjain and Prof. Y.D. Tiagi of Udaipur University, Rajasthan, who were at Sagar earlier, were very close to him.

POST RETIREMENT LIFE

In 1977, his friends, students, colleagues and admirers felicitated Prof. Saksena on the completion of sixty years and at the time of retirement from active service in the university and a Festschrift was brought out by the efforts of late Prof. K.S. Bilgrami and late Prof. K.M. Vyas in the form of 2 volumes and published by Bishen Singh & Mahendra Pal Singh of Dehradun.

In 1987, his erstwhile students and admirers had assembled at the principal seat of his academic career, the Botany Department, Sagar University, Sagar to celebrate his 70th birthday to wish that he should continue to enjoy a pleasant retired life for many years little realizing that our fond wishes are not going to be fulfilled, wrote Late B.S. Mehrotra in an obituary, published in the journal of Indian Phytopathology, Volume 42(1) of march 1989. After his retirement from active service at Sagar, Dr. Saksena continued to stay for one year at Sagar University as a visiting Professor in the year 1978 and after that he moved away to Jiwaji University, Gwalior to work on a UGC project entitled "Fungal Flora of M.P." Professor Saksena built his own house at Gwalior which he named "GYAN KUTIR"(21, Sri Ram Colony Gwalior). Professor S.B. Saksena passed away on 21st march 1988 at Gwalior. His wife Mrs. Sarla Saksena lived for a number of years in this house till her death in 2000.

THE TRIBUTE

Professor Saksena was a thorough gentleman and was a very much attached to his students and colleagues. Late Prof. B.S. Mehrotra (1989) stated that his academic attainments, amiable temperament and helpful attitude towards students and colleagues endeared him to all who came in contact with him. We need more Mycologists like him. There can be no two opinions about the academic standing of Late Prof. Saksena that among the contemporary mycologists of this era, he could be definitely ranked one amongst the top Indian Mycologists. Before we close, we pay our respectful tribute to him on this auspicious day of 10th August 2016 which marks the beginning of the centennial year of his birth. The idea of commemorating his centennial year of birth came to his students and admirers and on 10th of August 2016 a "National Mycology Meet on Mycology in relation to Biotechnology" which was held on 10th August 2016, at Bhopal where several of his students, well wishers and others paid glowing tributes to Late Professor Saksena for his contributions in the area of Mycology and Plant Pathology and as a fine and inspiring teacher and researcher of international repute. Whoever was fortunate enough to know him personally will remember him as a man in whom were united scientific greatness and modesty. We pay our respectful tributes to him on this occasion of centenary celebrations of his birth.

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