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Research fields

Insect-microbe associations – microbiomes and insect's fitness traits evolution.
Microbial biotechnology – actinomycetes and natural products research.
Coral disease biology and interactions.

Positions

HHMI Research Specialist Extavour Lab, Harvard University, USA	2022 - present
Postdoctoral Research Fellow Hebrew University of Jerusalem, Israel	2017 -2022
Postdoctoral Research Fellow CSIR Central Salt and Marine Research Institute, India	2015 - 2017
Senior Research Fellow Tamil Nadu Agricultural University, India	2014 - 2015
Lecturer of Biochemistry N.M.S. S. Vellaichamy Nadar College, India	2006 - 2009

Education

Ph.D. Biotechnology Madurai Kamaraj University, India	2009 - 2014
M.Phil. Biochemistry Bharathidasan University, India	2007 - 2008
M.Sc. Biochemistry Madurai Kamaraj University, India	2004 - 2006
B.Sc. Biochemistry Manonmanium Sundaranar University, India	2001 - 2003

Awards/ Grants/ Fellowships

CWS Scholarship, Center for Wildlife Studies, ME, USA	2021
PBC Outstanding PDF Extension Award Planning and Budgeting Committee & Hebrew University, Israel	2020
PBC Outstanding Post-Doctoral Researchers Fellowship Award Planning and Budgeting Committee & Hebrew University, Israel	2018
SERB Young Scientist International Travel Grant Science & Engineering Research Board, Govt. of India	2017
SGRF Travel/Meeting Grant SciGenome Research Foundation, India	2017
CSIR Nehru Science Postdoctoral Award Council of Scientific & Industrial Research, Govt. of India	2014
CSIR Senior Research Fellowship Council of Scientific & Industrial Research, Government of India	2013
UGC Meritorious Junior Research Fellowship University Grants Commission (UGC), Government of India	2010

Invited/ Contributed talks

*Italic font indicates talk title

Do gut microbiomes confer adaptive potential to their insect hosts?
SBC 2023, Birla Institute of Technology & Science, Goa, India 2023

Elucidating the role of ecology in the evolution of reproductive capacity in Drosophilidae
InDRC 2023, IISER-TVM, India 2023

Remarkable interactions between insects and bacteria
Tamil Nadu Agricultural University, India 2023

Microbial impacts on adaptive evolution - a study on Drosophila sechellia 2023
University of Seychelles, Seychelles

Adaptive interactions between insects and bacteria 2022
Plant Pathology and Microbiology Seminar, Hebrew University, Israel

Dynamic nature of Medfly gut microbiome 2021
3rd Insect Symbiosis meeting, Entomological Society of Israel, Israel

Can symbionts help with mass rearing of the Avian Vampire Fly? 2021
Philornis/landbird conservation workshop, Charles Darwin Foundation, Galapagos

Microbiome plasticity promotes polyphagy 2020
ISEB 2020, Israeli Society for Evolutionary Biology, Israel

Laboratory colonization alters the microbiome of the avian parasite Philornis downsi 2018
2rd Insect Symbiosis meeting, Entomological Society of Israel, Israel

Publications/ Presentations

*Complete list starts at page 6

Peer reviewed publications	42
Book chapters	3
Manuscripts undergoing peer review	1
Manuscript in preparation	2
Oral/poster presentations	17

Research Experience

Harvard University, USA (May 2022 - present)
Group leader: **Prof. Cassandra G. Extavour**
Research area: Role of microbiomes on adaptive evolution of *Drosophila*
Major study systems: Hawaiian *Drosophilidae*, *D.* melanogaster and *D. sechellia*

Hebrew University of Jerusalem, Israel (2017-2022)
Advisors: **Profs. Edouard Jurkevitch** & **Prof. Boaz Yuval**
Research area: Insect microbe interactions

- Microbiome manipulation in the monophagous olive fruit fly *Bactrocera oleae* on oviposition behaviour. This research showed that symbiotic bacteria affect oviposition behaviour in the olive fruit fly *B. oleae*. Symbiotic flies attempt oviposition significantly more times. Axenic flies complemented with gut microbiome oviposits like the symbiotic flies. Primary symbionts

are essential for *B. oleae* larval development (Publication # 6; *Journal of Insect Physiology*).

- Behavioural responses of the invasive fly Philornis downsi to stimuli from bacteria and yeast. The lab's proboscis extension response experiment shows that tarsal contact with stimuli from gut bacteria elicits significantly more responses than yeast stimuli. Although long-range trapping efforts yielded only a few flies, attractants were only the bacteria from bird faeces and from the gut of adult flies. (Publication # 5; *Insects*)
- Microbiome adaptation under shifting diet and domestication during ontogeny in the avian vampire fly *Philornis downsi* in the Galapagos Islands. Here it was found that life stage and diet are significant factors governing the gut microbiome dynamics of *P. downsi*. In the field adult, sex-dependent microbiome composition reflected discrete foraging behaviour of males and females. The change in the microbiome in response to rearing conditions and diet was found as a possible reason for the poor rearing success of this species in the laboratory. (Publication # 4; *Environmental Microbiology*).
- Effect of specific gut symbionts on larval behaviour in the fruit pest *Ceratitis capitata*. The study revealed that bacteria affect the foraging patterns of Medfly larvae. Extrinsically, larvae are significantly attracted to bacterial isolates identified as commensals, while bacteria identified as putative pathogens are shunned. Intrinsically, manipulation of the microbiome affects these patterns, suggesting a dynamic and plastic interaction between bacteria and larvae. Axenic larvae are significantly more active than fully symbiotic ones, and losing the ability to discern between commensal and pathogenic bacteria. (Publication # 3; *Animal Behaviour*).
- Effect of bacterial predation on the fruit pest medfly *Ceratitis capitata* gut microbiome. This paper showed that the bacterial predator of bacteria *B. bacteriovorus* prey and survive in vivo in the medfly gut. Encapsulated *B. bacteriovorus* predators maintain a sustainable population and prey in the fly's gut, altering its bacterial community. Predation did not bring about a decrease in survival but our tests of the effects of the predator on the fly's life history were limited to endpoint survival. (Publication # 2; *Journal of Applied Microbiology*).
- Fruit-host driven ecological selection and maternal effects on the gut microbiome of the fruit pest *Ceratitis capitata* (medfly). In this cross-generational, multiple fruit host design based extensive gut microbial community study, it was found that the microbiome associated with this insect is highly dynamic, with diversity cycling between life stages. Expansion occurs at the larval stage and includes an increase of fruit host and the larva’s lineage dependent variability. Diversity decreases in tenerals, yielding mothers having similar, low diversity communities. Maternal inoculum and host fruit jointly shapes the larval gut microbiome. Overall results indicated that microbiome re-shuffling effected by fruit habitat, metamorphosis and adult environment enables the ecological plasticity necessary to exploit numerous hosts. (Manuscript submitted # 1; *Microbiomes*).
- The functional importance of gut bacteria associated in the field and lab-grown *Philornis downsi* in the Galapagos Islands. This study elaborates the differential abundance of metabolic pathways specific to distinct life stages and the importance of different gut bacteria (Manuscript in preparation).

Central Salt & Marine Chemicals Research Institute, India (2015-2017)
Advisor: **Prof. Bhavanath Jha**
Research area: Bioprospection of Actinobacteria - multi-omics approach

- Biosynthetic potential of intertidal actinobacterial species. Phylogenetic diversity and targeted gene polymorphism studies show that intertidal sediments are a rich source of diverse cultivable Actinobacteria with high biosynthetic potential in their genomes (Publication # 10).
- Taxonomic characteristics of *Streptomyces*. Polyphasic taxonomic studies recognised five novel taxa affiliated to the genus *Streptomyces* (Manuscripts under submission).
- Collaborated on a series of studies revealing corals and their interactions with micro- and macro-organisms (Publications #13,15,17).

Agricultural College and Research Institute, Madurai, India (2014-2015)
Advisors: **Prof. R. Anandham** & **Prof. N.O. Gopal**
Research area: Microbial quorum sensing; Insect microbe interactions

- Factors affecting the endomicrobial communities in mealybugs. This study shows that microbial communities associated with *Paracoccus marginatus* and *Ferrisia virgata* show differences that appear to stem from phylogenetic associations and different nutritional requirements. (Publication #11).
- Quorum sensing signals of phytopathogen *Pseudomonas syringae* pv. *passiflorae*. Here it was found that *P. syringae* pv. *passiflorae* produce N-tetradecanoyl and N-hexanoyl homoserine lactones as quorum-sensing signal molecules that are targetable for biocontrol using homoserine lactones degrading bacteria (Publication #16).
- Microbes for bioremediation, plant growth promotion and biocontrol applications. In a series of studies, certain microbes were recognized as the candidates for eco-friendly bioremediation and enhanced crop production (Publications #8,12,14,20,25).
- Unique evolution of biosynthetic potential in desert Streptomyces. This research show that *Streptomyces* species inhabit desert environments have evolved with unique biosynthetic potential. (Publication # 21).

Madurai Kamaraj University, India (2009-2014)
Mentor: Late Prof. **S.R.D. Jebakumar**
Research area: Bioprospection - Actinobacteria of hypersaline habitats

- Culture-dependent actinobacterial diversity and phylogeny in hypersaline solar salterns. In the studies aimed at establishing actinobacterial resources for natural products research ended up with acquisition of *Streptomyces* and previously poorly culturable rare (non-streptomycete) species. Use of amplified 16S rDNA restriction polymorphism analysis efficiently dereplicated duplicates in among the isolates (Publications #30,36).
- Salt-tolerant actinobacteria against pathogenic microbes. In multistep screening experiments, it was found that both *Streptomyces* and non-streptomycete produce secondary metabolites with a broad-spectrum antimicrobial activity. Activity-guided purification and structural characterization showed that the active compounds belong to the polyketide class. (Publications #29,31,32,34,38).
- Statistical designs-based culture media formulation and optimization for an enhanced production of the secondary metabolites. It was found that micronutrients significantly affect secondary metabolites production; optimizing their levels improves production and bioactivity (Publications #26,28,35).
- Culture-dependent and culture-independent diversity and spatial distribution of *Streptomyces* in a desert environment. This study revealed that *Streptomyces* species in the desert are largely different from other specific species in other environments. (Publication # 10).

Research area: Pesticides in food materials

- HPLC based analysis of pesticides persistence in food materials.

Teaching Experience

N.M.S. Vellaichamy Nadar College, Madurai, India (2007-2009)
Lecturer of Biochemistry

PG Courses
Biomolecules
Microbial Biochemistry and Fermentation Technology
Cellular and Molecular Biology
Enzymes and Enzyme Technology

Editorial/ Peer Review Contributions
*Serving in Editorial Board

Archives of Microbiology
Academia Biology*
BMC Microbiology*
Current Microbiology
Coral Reefs
Discover Bacteria*
Frontiers in Microbiology
Heliyon
ISME Journal
International Journal of Pest Management
Journal of Applied Biomedicine
Journal of Applied Microbiology
Journal of Microbiology and Biotechnology
Journal of Microbiology
Microbiological Research
Polish Journal of Microbiology
PloS ONE
Scientific Reports
Science of Total Environment
The Microbes*

Society Memberships

Full-Member (2020-2022), International Society for Microbial Ecology
Life-Member, The Society of Biological Chemists (India)
Life-Member, Association of Microbiologists of India (AMI)
Life-Member, Indian Science Congress
Alumni Member, Academic council of N.M.S.S.V.N. College (India)

List of Publications

Manuscripts under preparation/review/revision

[1] **Jose, P.A.**, Jurkevitch, E., Yuval, B. (2024). Functional importance of gut associated microbiomes in *Philornis downsi.*

Published/In press

[1] Mookherjee, A., Mitra, M., Sason, G., **Jose, P.A.**, Martinenko, M., Pietrokovski, S., Jurkevitch, E., (2024). Flagellar stator genes control a trophic shift from obligate to facultative predation and biofilm formation in a bacterial predator. *mBio*, 15(8):e0071524.

[2] **Jose, P.A.**, Yuval, B., and Jurkevitch, E. (2023). Maternal and host effects mediate the adaptive expansion and contraction of the microbiome during ontogeny in a holometabolous, polyphagous insect. *Functional Ecology*, 37: 929-946.

[3] Sivakala, K.K., **Jose, P.A.**, Shamir, M.F., Wong, A.C-M., Jurkevitch, E., Yuval, B., (2022). Foraging behaviour of medfly larvae affected by maternally transmitted and environmental bacteria. *Animal behaviour*, 183: 169-176.

[4] **Jose P.A.**, Ben-Yosef, M., Lahuatte, P., Causton, C.E., Heimpel, G.E., Jurkevitch, E., and Yuval B., (2021). Shifting microbiomes complement life stage transitions and diet of the bird parasite *Philornis downsi* from the Galapagos Islands. *Environmental Microbiology*, 23: 5014-5029.

[5] Sivakala, K.K., **Jose, P.A.**, O. Matan, C. Zohar-Perez, A. Nussinovitch, E. Jurkevitch., (2021). *In vivo* predation and modification of the Mediterranean fruit fly *Ceratitis capitata* (Wiedemann) gut microbiome by the bacterial predator *Bdellovibrio bacteriovorus*. *Journal of Applied Microbiology*, 131: 2971-2980.

[6] Yuval, B., Lahuatte, P., **Jose, P.A.**, Causton, C.E., Jurkevitch, E., Kouloussis, N., Ben-Yosef, M., 2019. Behavioural responses of the invasive fly *Philornis downsi* to stimuli from bacteria and yeast in the laboratory and the field in the Galapagos Islands. *Insects*, 10(12):431.

[7] **Jose. P.A.***, Ben-Yosef M., Jurkevitch, E., Yuval, B., 2019. Symbiotic bacteria affect oviposition behaviour in the olive fruit fly *Bactrocera oleae*. *Journal of Insect Physiology*, 117: 103917.

[8] Cibichakravarthy, B., and **Jose, P.A.***, (2021). Biosynthetic potential of *Streptomyces* rationalizes genome- based bioprospecting. *Antibiotics* 2021, 10, 873; doi: 10.3390/antibiotics10070873.

[9] Senthilkumar, M., Pushpakanth, P., **Jose P.A.**, Krishnamoorthy, R., Anandham, R., (2021). Diversity and functional characterization of endophytic *Methylobacterium* isolated from banana cultivars of South India and its impact on early growth of tissue culture banana plantlets. *Journal of Applied Microbiology*, 131: 2448-2465.

[10] **Jose, P.A.***, Maharshi, A., Jha, B., (2021). Actinobacteria in natural products research: progress and prospects. *Microbiological Research*, 246: 126708.

[11] Sivakala, K.K., Gutiérrez-García, K., **Jose, P.A.***, Thinesh, T., Barona-Gomez, F., Rangasamy, A., Sivakumar, N., (2021). Desert environments facilitate unique evolution of biosynthetic potential in *Streptomyces*. *Molecules*, 26: 588.

[12] **Jose, P. A.**, Krishnamoorthy, R., Gandhi, P. I., Senthilkumar, M., Jamahiraman, V., Kumutha, K., et al., 2020. Endomicrobial community profiles of two different mealybugs: *Paracoccus marginatus* and *Ferrisia virgata*. *Journal of Microbiology and Biotechnology*, 30: 1013–1017.

[13] Krishnamoorthy, R., Roy Choudhury, A., **Jose, P.A.**, Suganya, K., Senthilkumar, M., Prabhakaran, J., Gopal, N.O., Choi, J., Kim, K.,

Anandham, R., Sa, T., (2021). Long-term exposure to azo dyes from textile wastewater causes the abundance of *Saccharibacteria* population. *Applied Sciences*, 11:379.

[14] Thinesh, T., Meenatchi, R., Lipton, A. N., Anandham, R., **Jose, P. A.**, Tang, S. L. et al., 2020. Metagenomic sequencing reveals altered bacterial abundance during coral-sponge interaction: Insights into the invasive process of coral-killing sponge *Terpios hoshinota*. *Microbiological Research*, 240, 126553.

[15] Krishnamoorthy, R., **Jose, P.A.**, Janahiraman, V., Indira-Gandhi, P., et al., 2020. Function and insecticidal activity of bacteria associated with papaya mealybug, *Paracoccus marginatus* Williams & Granara de Willink (Hemiptera: Pseudococcidae). *Biocontrol Science and Technology*, 30: 762-778.

[16] Thinesh, T., **Jose, P.A.**, Ramasamy, P., Meenatchi, R., Selvan, K.M., Selvin, J., 2019. Differential coral response to algae contacts: *Porites* tissue loss, praise for *Halimeda* interaction at southeast coast of India. *Environmental Science and Pollution Research*, 26: 17845–17852.

[17] **Jose, P.A.**, Krishnamoorthy, R., Kwon, SW. et al., 2019. Interference in quorum sensing and virulence of the phytopathogen *Pseudomonas syringae* pv. *passiflorae* by *Bacillus* and *Variovorax* species. *BioControl*, 64: 423-433.

[18] Thinesh, T., Meenatchi, R., **Jose, P.A.**, Kiran, G.S. and Selvin, J., 2019. Differential bleaching and recovery pattern of southeast Indian coral reef to 2016 global mass bleaching event: Occurrence of stress-tolerant symbiont *Durusdinium* (Clade D) in corals of Palk Bay. *Marine Pollution Bulletin*, 145: 287-294.

[19] Masand, M., Sivakala, K.K., Menghani, E., Thinesh, T., Anandham, R., Sharma, G., Sivakumar, N., Jebakumar, S.R.D. and **Jose, P.A.***, 2018. Biosynthetic potential of bioactive streptomycetes isolated from arid region of the Thar Desert, Rajasthan (India). *Frontiers in Microbiology* 9: 687.

[20] Sivakala K.K, **Jose P.A.**, Anandham R., Thinesh T., Jebakumar S.R.D., Samaddar S., Chatterjee P., Sivakumar, N. and Sa, T., 2018. Spatial Physiochemical and Metagenomic Analysis of Desert Environment. *Journal of Microbiology and Biotechnology*, 28: 1517-1526.

[21] Krishnamoorthy R., K., **Jose P.A**, Ranjith M., Anandham R., et. al., 2018. Decolourisation and degradation of azo dyes by mixed fungal culture consisted of *Dichotomomyces cejpii* MRCH 1-2 and *Phoma tropica* MRCH 1-3. *Journal of Environmental Chemical Engineering*, 6: 588-595

[22] **Jose, P.A.*** and Jha B.*, (2017). Intertidal marine sediment harbours actinomycetes with promising bioactive and biosynthetic potential. *Scientific Reports* 7: 10041.

[23] Thinesh, T., Meenatchi, R., Tang, S-L., **Jose P.A.**, Kiran, G.S. and Selvin, J., 2017. Short-term *in situ* shading effectively mitigates linear progression of coral-killing sponge *Terpios hoshinota*. *PLOS ONE* 12: e0182365.

[24] **Jose, P.A.*** and Jha B.*, 2016. New dimensions of research on actinomycetes: quest for next generation antibiotics. *Frontiers in Microbiology*, 7, 01295.

[25] Masand, M., **Jose, P. A.***, Menghani, E. and Jebakumar, S. R. D., 2015. Continuing hunt for endophytic actinomycetes as a source of novel biologically active metabolites. *World Journal of Microbiology and Biotechnology*, 31: 1863 - 1875.

[26] Premalatha, P., Gopal, N. O., **Jose, P.A.,** and Anandham R., 2015, Characterization of cellulase producing *Enhydrobactor* and its application in biomass saccharification. *Frontiers in Microbiology* 6: 1046.

[27] Rajeswari, P., **Jose, P. A.#**, Amiya, R. and Jebakumar, S. R. D., 2015. Characterization of saltern based *Streptomyces* sp. and statistical media optimization for its improved antibacterial activity. *Frontiers in Microbiology*, 5, 753, doi: 10.3389/fmicb.2014.00753.

[28] **Jose, P. A.** and Jebakumar, S. R. D., 2014. Unexplored hypersaline habitats are sources of novel actinomycetes. *Frontiers in Microbiology* 5:242.

[29] **Jose, P. A.** and Jebakumar, S. R. D., 2014. Successive nonstatistical and statistical approaches for the improved antibacterial activity of rare actinomycete *Nonomuraea* sp. JAJ18. *BioMed Research International*, 2014: 906097**.** doi:10.1155/2014/906097.

[30] **Jose, P. A.** and Jebakumar, S. R. D., 2013. Non-streptomycete actinomycetes nourish the current microbial antibiotic drug discovery. *Frontiers in Microbiology* 4:240. doi: 10.3389/fmicb.2013.00240

[31] **Jose, P. A.** and Jebakumar, S. R. D., 2013. Phylogenetic appraisal of antagonistic, slow growing actinomycetes isolated from hypersaline inland solar salterns at Sambhar Salt Lake, India *Frontiers in Microbiology* 4:190.

[32] **Jose, P. A.**, Santhi, V. S. and Jebakumar, S. R. D., 2011. Phylogenetic affiliation, antimicrobial potential and PKS gene sequence analysis of moderately halophilic *Streptomyces* sp. isolated from an Indian saltpan. *Journal of Basic Microbiology*, 51: 348-356.

[33] **Jose, P. A.**, Sivakala K. K., Rajeswari P. and Jebakumar, S. R. D., 2014. Characterization of antibiotic producing rare actinomycete *Nonomuraea* sp. JAJ18 derived from an Indian coastal solar saltern. *The Scientific World Journal* 2014: 456070. doi: 10.1155/2014/456070.

[34] Thinesh T, **Jose, P. A.**, and Patterson, E. J. K., 2013. Predominant bacterial candidates associated with diseased corals from Gulf of Mannar, India. *Journal of Pure Applied Microbiology* **7**: 2397-2403.

[35] **Jose, P. A.,** and Jebakumar S. R. D., 2013. Diverse Actinomycetes from Indian coastal solar salterns - a resource for antimicrobial screening. *Journal of Pure Applied Microbiology* 7: 2567-2575

[36] **Jose, P. A.**, Sivakala, K. K. and Jebakumar, S. R. D., 2013. Formulation and statistical optimization of culture medium for improved production of antimicrobial compound by *Streptomyces* sp. JAJ06. *International Journal of Microbiology* 2013: 526260.

[37] **Jose, P. A.** and Jebakumar, S. R. D., 2012. Phylogenetic diversity of actinomycetes cultured from coastal multipond solar saltern in Tuticorin, India. *Aquatic Biosystems,* 8: 23**.**

[38] Thinesh, T., **Jose, P. A.**, Hassan, S., Selvam, M. K. and Selvin, J., 2015. Intrusion of Coral-killing sponge (*Terpios hoshinota*) on the reef of Palk Bay. *Current Science*, 109, 1030-1032.

[39] **Jose, P. A** and Jebakumar, S. R. D., 2015. Taxonomic and antimicrobial profiles of a rare actinomycete isolated from an inland solar saltern (India). *Indian Journal of Geo-marine Sciences,*

[40] **Jose, P. A.**, Shanmuga sundari, I., Sivakala, K.K., and Jebakumar, S. R. D., 2014. Molecular phylogeny and plant growth promoting traits of endophytic bacteria isolated from roots of seagrass *Cymodocea serrulata*. *Indian Journal of Geomarine Sciences*, 43 (4): 571-579**.**

[41] Mershiba, L. and **Jose, P. A.**, 2010. Endophytic fungi from *Calotropis gigantea*: isolation and biodiversity. *Journal Basic and Applied Biology* 4: 65-68

Book chapters

[42] Ramya-Sree B., **Jose P.A.**, Divakar K., 2020. Fermentative production of secondary metabolites from bioengineered fungal species and their applications. In: Hesham AL., Upadhyay R., Sharma G., Manoharachary C., Gupta V. (eds) Fungal Biotechnology and Bioengineering. Fungal Biology. Springer, Cham.

[43] **Jose P.A.**, Sivakala, K.K., Jha, B., 2018. Non-Streptomyces actinomycetes and natural products: recent updates, Studies in Natural Products Chemistry, Volume 61, Elsevier.

[44] Hameed, M. S., Anandham, R., Premalatha, N., Karthik, M., Ranjith, M., **Jose P. A.**, Prabhaharan, J., Thiyageshwari, S. and Gopal, N. O., 2014. Prospects of silicate solubilizing bacterial inoculants in sustainable agriculture. Nova Science Publishers, New York.