

## **CALL FOR AWARDING RESEARCH FELLOWSHIPS WITHIN PROJECT GRANTS AND R&D INSTITUTIONS**

**Ref.: RF-MSc-SYMBIOSES**

One Research Fellowship (Master Degree) is opened by the **Faculdade de Ciências da Universidade de Lisboa**, under the exploratory project “*The secret of a winning strategy: common mechanisms in different symbioses*”, financed by Fundação para a Ciência e a Tecnologia, I.P. (FCT), under the FCT Investigator Start-up Grant, under the following conditions:

**1. Scientific Area:** Biological science and related areas.

### **2. Requirements for admission:**

- A. Admission criteria: Possession of a master degree in Biological Science or related areas, independently of the time taken to acquire it; possession of a valid driving licence;
- B. Qualifications and experience: Educational background relevant for the chosen project (previous experience in lab and field work); experience in statistical analysis;
- C. Communication skills: Effective communication skills in English, both written and verbal, report writing skills and experience of delivering presentations;
- D. Team working: Ability to work as part of a multidisciplinary research team, show enthusiasm, initiative and possess good interpersonal skills.

In respect to requirement B. it will be given preference to candidates with research experience in the field of lichens or mycorrhizas and in possession of scientific publications.

### **3. Work plan**

Duration: 6 months

Zea mays will be cultivated and colonized with three different mycorrhizal fungi: Glomus intraradices, an arbuscular mycorrhizal fungus commonly used as a soil inoculant in agriculture and for which complete sequenced genome is available, Glomus mosseae known to highly favor nutrient absorption in particular of phosphorous and N, and Gigaspora sp. a completely different fungus in terms of host specificity, interaction with microorganisms etc, and whit big spores that work as an important carbon sink.

Climate chamber and N external supplies, separately and in combination, will simulate climate change and N loads in lab to perform short term experiments under controlled conditions.

The effects of stress gradients will be assessed monthly from the beginning of the treatment on lichens and mycorrhizal plants by a series of tests (nondisruptive measurements will be performed every 15 days):

- Chl a fluorescence parameters (Handy Pea fluorimeter, Hansatech)
- photosynthetic rate and respiration (GFS3000 Walz)
- ergosterol and chitin (HPLC)
- extra and intracellular compartmentation of N (Berthelot reaction)
- cellular membrane damage expressed as the linkage of intracellular ions (electrical conductivity)
- fungus viability (TTC triphenyltetrazolium chloride essay)
- total C and N (N and C isotopes) to observe the connections between C and N cycles
- analysis of pigments (HPLC)
- pH measurements
- extracellular enzymatic activity (28)
- secondary compounds production (HPLC).

Duration: 2 months

Field experiments will be designed to test in the field the results obtained in the laboratory.

Duration: 1 month

C and N containing compounds (CO<sub>2</sub>, NH<sub>3</sub>, NO<sub>x</sub>, organic C, aminoacids, oligopeptides, polyamines) labeled with stable isotopes (a) and/or quantum dots (b) will be provided to the two symbiotic associations under a gradient of different stress conditions to follow metabolic pathways and compound translocation inside the organisms respectively.

In (a), the compounds will be labelled by replacing specific atoms by their stable isotope. Then, they will be supplied to lichens/plants where they will undergo the metabolic reactions. The final position of the isotopes in the lichens/plants will be measured to determine if they are exchanged between partners and are part of the stress signalling.

Duration: 1 month

Antioxidant activity enables xerophilous lichens and mycorrhizal plants to survive prolonged dryness, high photosynthetic photon flux density and high temperatures.

The antioxidant activity will be assessed by four methods: free radicals

- DPPH•(1,1diphenyl-2-picrylhydrazyl),
- nitric oxide assay,

- betacarotene
- bleaching test and metal chelating power (E).

Moreover, H<sub>2</sub>O<sub>2</sub> is one of the reactive oxygen species which accumulates as a consequence of oxidative stress and in case of impairment of antioxidant mechanisms. The H<sub>2</sub>O<sub>2</sub> content of lichen thalli and plants will be measured colorimetrically (absorbance at 410 nm of supernatant resulting from homogenized sample) as a measure of oxidative stress due to N and drought.

Duration: 1 month

The fluxomics involving both pathways of polyamines synthesis from arginine will be checked. Amino acids, amines and polyamines will be measured using HPLC. Polyamines production will be investigated in relation to drought and N stress.

Duration: 1 month

To investigate and compare the functioning of GS/GOGAT pathway in lichens and mycorrhiza, and its relevance to N tolerance as well as its comparative importance in relation to glutamate dehydrogenase (GDH). For that, we will measure the expression of the GS and GDH using immunodetection (antibodies for the respective enzymes).

**4. Legislation framework:** Law No. 40/2004, of August 18th, as amended and republished by Decree-Law No. 202/2012 of August 27th, by Decree-Law No. 233/2012 of October 29th, by Law No. 12/2013, of January 29th, and by Decree-Law No. 89/2013 of July 9th and Lisbon University Fellowships Regulation, published by Order (extract) No. 6977/2015 of June 23rd.

**5. Place of work:** The work will be developed at Faculdade de Ciências da Universidade de Lisboa.

**6. Scientific orientation:** Dr Silvana Munzi.

**7. Fellowship duration:** The fellowship will have the duration of 6 months, expected to start on October 2015, with the possibility to be extended for periods of 3 months, to a maximum of 6 months.

**8. Monthly allowance:** The fellowship amounts to € 980.00 (nine hundred and eighty euros), according to Lisbon University Fellowships Regulation, paid monthly by bank transfer.

**9. Selection method:**

The selection method follows the classifications obtained adopting the following weights: 50% for curriculum evaluation and 50% for selection interview.

There will be admitted to the selection interview the 6 (six) candidates with the highest classifications obtained in the curriculum evaluation.

**10. Selection Committee:** Silvana Munzi (President), Cristina Cruz (1st effective member), Cristina Branquinho (2nd effective member), Teresa Dias (1st alternate member) and Pedro Pinho (2nd alternate member).

**11. Publication/notification of results:** The final results of the evaluation will become public, through a final grade ordered list which will be posted at the entrance hall of Faculdade de Ciências da Universidade de Lisboa, C4 bldg, Campo Grande, 1749-016 Lisboa.

All applicants will be notified of the results of the evaluation to the email address used for sending the respective application, or by post to the applicant's address.

**12. Deadlines:** This call for applications is open from September 2<sup>nd</sup>, 2015 to September 15<sup>th</sup>, 2015.

**13. Form of applications:** Applications must be sent via e-mail to [candidaturas@ciencias.ulisboa.pt](mailto:candidaturas@ciencias.ulisboa.pt), with the subject "**RF-MSc-SYMBIOSES**", by attaching the following documents:

- **In the case of being Portuguese citizen**, copy of identification document (ID card or citizen card);
- **In the case of not being Portuguese citizen**, copy of identification document (ID card or passport) as well as residence authorization, permanent residence authorization or long-term resident status, if applicable;
- If you agree to be notified for your e-mail address, please send obligatorily the declaration annexed to this Notice;
- Certificates of qualifications of all obtained academic degrees, with the final ranking;
- *Curriculum Vitae*, detailed and updated, stating obligatorily the full candidate's address;
- Document of employment status, indicating the nature of the bond and functions; this document can be replaced by a declaration under honour commitment if there is any professional activity or the provision of services;
- Cover letter;
- Optionally, letters of recommendation.

## DECLARATION

\_\_\_\_\_ (name of the candidate), declare that if the selection jury chooses to communicate and or notify applicants by e-mail, I agree that such communications and or notifications are made to the email address used for submission of my application.

(Date)

(Signature)