Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Nina Gunde – Cimerman nina.gunde-cimerman@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

Mikrobiologija ekstremnih okolij

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Glive živijo v različnih skrajno slanih okoljih, kjer so izpostavljene nizki vodni aktivnosti in velikim koncentracijam ionov. Pri nasičenih koncentracijah se soli obarjajo. Primer takega okolja so morske soline, kjer pridobivamo mineral halit (NaCl oz. morska sol). Glive ne naseljujejo samo morskih solin, kot so npr. Sečoveljske soline (Gunde-Cimerman s sod., 2000), temveč so bile osamljene tudi iz kislih, slanih in z žveplom bogatih jezer Magic in Gneiss v Avstraliji (Benison s sod., 2025), vulkanskih kislih in slanih vod v Mehiki, iz evaporitnih alkalnih jezer na visokih planotah Bolivije, ki poleg ostalih soli vsebujejo še boraks in tudi iz arteških slanih vodnjakov v puščavi Kalahari, Južna Afrika (Gunde-Cimerman, neobjavljeno). Ti izolati dokazujejo, da se glive niso prilagodile samo na življenje v vodah z visokimi koncentracijami NaCl, temveč tudi drugih soli, kot so MgCl2, MgSO4, NaBr in LiCl. Preliminarni rezultati nakazujejo, da bi lahko glive imele pomembno vlogo pri procesu kristalizacije teh različnih soli, ki bi jim lahko služile kot zaščita v spreminjajočih skrajnih pogojih. Dosedanje raziskave biomineralizacije s pomočjo gliv so bile narejene samo v mezofilnih okoljih.
Znano je, da imajo pri glivnem oblikovanju mineralov in kristalov pomembno vlogo kisline, zlasti oksalna kislina. Čeprav oksalate, soli oksalne kisline, v literaturi večinoma obravnavajo kot glivne odpadne metabolite, pa imajo lahko številne funkcionalne vloge, kot so detoksifikacija kovin, njihova redukcija in preko tega vpliv na kroženja kovin, fosforja, žvepla in drugih elementov, sodelovanje pri raztapljanju in oblikovanje mineralov (Gadd s sod., 2014). Poleg tega oksalati vplivajo na povečanje občutljivosti rastlin na glivne okužbe in delujejo kot donor elektronov pri procesih razgradnje lignoceluloze. Geomikrobiološka vloga oksalne kisline in oksalatov ter drugih glivnih kislin in njihovih soli pri kristalizaciji oz. biomineralizaciji v izjemno slanih naravnih okoljih pa je še vedno povsem nepojasnjena. Sposobnost biomineralizacije gliv ima tudi aplikativni pomen. Ena od možnih aplikacij biomineralizacije je popravljanje in izboljšanje lastnostih organskih in anorganskih gradbenih materialov, kot so les, kamen in beton. Glivni biominerali lahko zmanjšajo poroznost materialov in oblikujejo zaščitne sloje ter jih tako regenerirajo. Največji tovrstni potencial imajo alkalofilne glive, prilagojene na zahtevne alkalne pogoje v betonu (Jin in sod., 2018). Trenutno velja za eno najbolj obetavnih metod za popravljanje razpok v betonu obarjanje CaCO3 s hidrolizo sečnine (Martuscelli in sod., 2020), preko ureazne aktivnosti. Sečnina ($CO(NH_2)_2$) hidrolizira v amonij (NH_4^+) in karbonat (CO_3^{2-}), ki nato reagira s Ca^{2+} ioni in povzroči obarjanje $CaCO_3$ v okolici micelija ali pa na površini celične stene gliv (Van Wylick in sod., 2021).
Cilji doktorske naloge bodo (i) izbor, identifikacija in osnovna fiziologija halo- in alkalo-filnih gliv iz različnih slanih okolij po svetu, (ii) proučiti njihovo sposobnost obarjanja mineralov kot mehanizma zaščite pri rasti na visokih koncentracijah različnih soli in (iii) aplikacije teh gliv v/na različne materiale za njihovo zaščito in popravljanje preko oblikovanja biogenih mineralov.
Metode: Identifikacija gliv bo potekala z uporabo uveljavljenih molekularnih markerjev. Fiziološka karakterizacija izolatov, kot je pH toleranca, T toleranca, toleranca oz. optimum rasti na slanih gojiščih, bo proučevana z uporabo različnih pristopov (rastne krivulje, respiracija, itd.). Sposobnosti biomineralizacije gliv bomo ugotavljali na posebno sestavljenih gojiščih z različnimi solmi. Sintezo glivnih organskih kislin bomo določali s HPLC, glivne kristale z RAMAN-ovo spektroskopijo, oblikovane biominerale pa s SEM-EDS.

Eng.: Fungi live in various extremely salty environments, where they are exposed to low water activity and high concentrations of ions. At saturated concentrations, salts precipitate. An example of such an environment is sea salterns, where the mineral halite (NaCl or sea salt) is obtained. Fungi do not only inhabit sea salterns, such as the Sečovlje salterns (Gunde-Cimerman et al., 2000), but have also been isolated from acidic, saline and sulfur-rich Magic and Gneiss lakes in Australia (Benison et al., 2025), volcanic acidic and saline waters in Mexico, from evaporite alkaline lakes on the high plateaus of Bolivia, which contain borax in addition to other salts, and also from artesian salt wells in the Kalahari Desert, South Africa (Gunde-Cimerman, unpublished). These isolates

demonstrate that fungi have adapted not only to life in waters with high concentrations of NaCl, but also to other salts such as MgCl2, MgSO4, NaBr and LiCl. Preliminary results suggest that fungi may play an important role in the crystallization process of these various salts, which could serve as a protection for them in changing extreme conditions. Previous studies on biomineralization by fungi have only been conducted in mesophilic environments. It is known that acids, especially oxalic acid, play an important role in fungal mineral and crystal formation. Although oxalates, salts of oxalic acid, are mostly considered in the literature as fungal waste metabolites, they can have numerous functional roles, such as metal detoxification, their reduction and, through this, their influence on the circulation of metals, phosphorus, sulfur and other elements, participation in dissolution and mineral formation (Gadd et al., 2014). In addition, oxalates increase the susceptibility of plants to fungal infections and act as electron donors in the processes of lignocellulose decomposition. The geomicrobiological role of oxalic acid and oxalates and other fungal acids and their salts in crystallization or biomineralization in extremely salty natural environments is still completely unexplained.

The biomineralization ability of fungi also has applied significance. One of the possible applications of biomineralization is the repair and improvement of the properties of organic and inorganic building materials, such as wood, stone and concrete. Fungal biominerals can reduce the porosity of materials and form protective layers, thus regenerating them. Alkaliphilic fungi, adapted to the demanding alkaline conditions in concrete, have the greatest potential in this regard (Jin et al., 2018). Currently, one of the most promising methods for repairing cracks in concrete is the precipitation of $CaCO_3$ by urea hydrolysis (Martuscelli et al., 2020), via urease activity. Urea ($CO(NH_2)_2$) hydrolyzes to ammonium (NH_4^+) and carbonate (CO_3^{2-}), which then reacts with Ca^{2+} ions and causes the precipitation of $CaCO_3$ around the mycelium or on the surface of the fungal cell wall (Van Wylick et al., 2021).

The objectives of the doctoral thesis will be (i) the selection of halo- and alkalo-philic fungi from different saline environments around the world, (ii) to study their ability to precipitate salt minerals as a protection mechanism when growing at high concentrations of different salts and (iii) the application of these fungi in/on various materials for their protection and repair through the formation of biogenic minerals.

Methods: Fungi will be identified using established molecular markers. Physiological characterisation of isolates, such as pH tolerance, T tolerance, tolerance or growth optimum on saline media, will be studied using different approaches (growth curves, respiration, etc.).The biomineralisation capacity of fungi will be determined in specially formulated media with different salts. Fungal organic acid synthesis will be determined by HPLC, fungal induced mineral formations by SEM-EDS, and crystals will be determined by Raman spectroscopy.

Literature

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5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☒ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

prof. dr. Klemen Jerina, e-pošta: klemen.jerina@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

področje: Gozdarstvo, lesarstvo in papirništvo; podpodročje Gozd-gozdarstvo

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Usposabljanje mladega raziskovalca bo potekalo na Oddelku za gozdarstvo in obnovljive gozdne vire Biotehniške fakultete Univerze v Ljubljani (UL) v Raziskovalni skupini za ekologijo in upravljanje prostoživečih živali pod mentorstvom prof. dr. Klemena Jerina ter v sodelovanju z drugimi člani skupine in oddelka. Usposabljanje bo zajemalo področja: ekologija in upravljanje prostoživečih živali, gozdni ekosistemi, vloge in pomeni živalskih vrst v gozdnih ekosistemih, vzajemni vplivi med živalskimi vrstami (zlasti sesalci) in drevesnimi vrstami v gozdovih s poudarkom na srednji Evropi. Raziskave v okviru doktorske disertacije bodo predvidoma usmerjene v preučevanje in razumevanje vloge navadnega polha (*Glis glis*) kot ključne vrste v listopadnih gozdovih Dinaridov. Osrednje raziskovalne podteme teme bodo predvidoma: i.) vpliv cikličnih obrodov drevesnih vrst z mastnim semenom na medletno in letno aktivnost ter populacijsko dinamiko polhov, vključno s sinhronizacijo njihove aktivnosti z obrodi, ii.) raba polšin (vhodov v podzemne jame - skrivališča) in gozda, iii.) prehrana polha, vključno z analizo potencialnega prehranjevanja z nevretenčarji v podzemlju v letih brez obrodov, iv.) polh kot plenska vrsta: vrstni spekter in strategije plenilcev, ki lovijo pred polšinami, ter obrambne strategije polha.

Navadni polh je bil v Sloveniji pomembna lovna in gospodarska vrsta. Njegova biomasa lahko večkrat presega skupno biomaso vseh parkljarjev. Ekološko in gospodarsko je pomemben zaradi obročkanja drevja, plenjenja semena in vloge plenske vrste. Preliminarne raziskave nakazujejo, da bi lahko bil ena ključnih vrst dinarskih gozdnih ekosistemov z razvitimi kraškimi pojavi (skrivališča v času neaktivnosti), saj prek njega poteka pomemben prenos energije semen plodonosnih drevesnih vrst (nekaj ton/ha letno) do višjih trofičnih ravni. Vendar so ti vidiki so v listopadnih gozdovih na visokem krasu, ki predstavljajo optimalen habitat vrste, praktično nepreučeni, vrsta pa upoštevaje njen pomen v splošnem raziskovalno slabo pokrita.

Raziskave bodo vključevale terensko in laboratorijsko delo, predvidoma: i.) spremljanje aktivnosti polhov in njihovih plenilcev s fotopastmi; ii.) odlov in mikročipiranje polhov ter spremljanje njihove aktivnosti z avtomatskimi sledilci (tuljave); iii.) zbiranje vzorcev za analizo prehrane ter sodelovanje pri analizah prehrane (klasična histološka analiza in metabarkodiranje); iv.) analizo posnetkov z umetno inteligenco (AI), uporabo GIS in bioinformacijskih orodij za analizo podatkov. Mladi raziskovalec bo svoje ugotovitve predstavljal na domačih in mednarodnih konferencah ter v znanstvenih publikacijah.

Pogoji za prijavo

Kandidat za delovno mesto mladega raziskovalca mora imeti predhodno izobrazbo s področja gozdarstva ali sorodnih ekoloških ved. Mladi raziskovalec se bo vpisal na doktorski študij Bioznanosti, smer Upravljanje gozdnih ekosistemov. Pričakuje se aktivno znanje slovenskega in angleškega jezika. Zaželene so izkušnje z laboratorijskim delom, samoiniciativnost, smisel za timsko delo in veselje do znanstvenega raziskovanja, vključno s terenskim delom, laboratorijsko analizo in obdelavo podatkov.

Glavne **naloge** kandidata (i.) Izvajanje doktorskega študija in raziskovalnega dela, povezanega s temo doktorske naloge (ii.) Sodelovanje pri raziskovalnih projektih in pedagoškem delu. (iii) Predstavitev rezultatov doktorske raziskave na domačih in mednarodnih konferencah ter objava v znanstvenih revijah. (iv) Usklajevanje lastnega raziskovalnega dela in sinergija z drugimi vzporednimi raziskavami članov skupine (doma in v tujini zlasti na Poljskem).

Training of a Young Researcher

The training of the young researcher will take place at the Department of Forestry and Renewable Forest Resources at the Biotechnical Faculty, University of Ljubljana (UL), within the Research Group for Wildlife Ecology and Management, under the mentorship of prof. dr. Klemen Jerina and in collaboration with other members of the group and department.

The training will cover the following areas: wildlife ecology and management, forest ecosystems, the roles and impacts of animal species in forest ecosystems, and the mutual interactions between animal species (especially mammals) and tree species in forests, with a focus on Central Europe. The doctoral dissertation research will likely focus on studying and understanding the role of the edible dormouse (Glis glis) as a key species in the deciduous forests of the Dinarides. The main research subtopics are expected to include: i.) The impact of cyclic mast seeding of tree species on the annual and interannual activity and population dynamics of dormice, including the synchronization of their activity with seed production. (ii.) The use of "polšine" (entrances to underground caves used as shelters) and forest habitats. iii.) Dormouse diet, including the analysis of potential invertebrate consumption in underground habitats during non-mast years. iv.) The dormouse as a prey species: the species composition and strategies of predators hunting near polšine and the dormouse's defensive strategies.

The edible dormouse has historically been an important game and economic species in Slovenia. Its biomass can several times exceed the total biomass of all ungulates combined. Ecologically and economically, it is significant due to tree ring-barking, seed predation, and its role as a prey species. Preliminary research suggests that it may be a key species in the Dinaric forest ecosystems with developed karst phenomena (serving as a shelter during inactivity), as it facilitates a major transfer of energy from tree seeds (several tons per hectare annually) to higher trophic levels. However, these aspects remain practically unstudied in deciduous forests of the high karst, which represent the species' optimal habitat.

The research will include both field and laboratory work, potentially involving: i.) Monitoring the activity of dormice and their predators using camera traps. ii.) Trapping and microchipping dormice and tracking their activity using automated trackers. iii.) Collecting samples for dietary analysis and participating in diet analysis (classical histological analysis and metabarcoding). iv.) Analysing footage using artificial intelligence (AI), applying GIS, and utilizing bioinformatics tools for data analysis.

The young researcher will present their findings at national and international conferences and publish in scientific journals.

Application Requirements

Candidates for the young researcher position must have prior education in forestry or related ecological sciences. The young researcher will enrol in the doctoral program in Biosciences, specializing in Forest Ecosystem Management. Active proficiency in both Slovenian and English is desirable. Experience in laboratory work, self-initiative, teamwork skills, and enthusiasm for scientific research—including fieldwork, laboratory analysis, and data processing—are desirable.

Main Responsibilities of the Candidate

i.) Conducting doctoral studies and research related to the dissertation topic. ii.) Participating in research projects and teaching activities. iii.) Presenting doctoral research results at national and international conferences and publishing in scientific journals. iv.) Coordinating their own research with parallel research conducted by supervisor nad other group members (both domestically and internationally).

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☐ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☐ **nagrade** *(awards (e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Univerza v Ljubljani, Biotehniška fakulteta

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Anja Klančnik, anja.klancnik@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

4.02 Biotehnika / Živalska produkcija in predelava

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.:

Raziskovalna tema posega v aktualen problem živilske verige - proizvodnje obstojne in varne hrane. Izpostavljena bo odpornost patogenih bakterij, prenosljivih s hrano, ki predstavlja grožnjo javnemu zdravstvu, saj pozvročajo stalno kontaminacijo in ponavljajoče se okužbe. Raziskovalni model bodo bakterije rodu *Campylobacter* spp., vodilni povzročitelji črevesnih okužb ljudi v razvitih državah. »Globalni akcijski načrt proti razvoju mikrobne odpornosti« in pristop »Eno zdravje« [1] usmerjata v razvoj novih metod, alternativnih načinov nadzora kontaminacij in/ali zdravljenje okužb. **Poleg mikrobne odpornosti je eden od mehanizmov odpornosti tudi biofilm, ki bakterije ščiti pred neugodnimi okoljskimi dejavniki in imunskim odzivom gostitelja. Mikrobna odpornost** je naraščajoč problem v zdravstvu, kmetijstvu, živilstvu in okolju. Zaradi pretirane uporabe antibiotikov in počasnega razvoja alternativ bo postala vodilni vzrok smrti, ki letno stane do 35 milijard USD po svetu [2]. **Biofilmi** so mikrobne združbe na površinah, obdane z zunajceličnim ovojem, ki preprečujejo prodiranje zatiralnih sredstev [3]. Biofimi letno povzročijo 4 milijone okužb in 40.000 smrti v EU, s smrtnostjo okužb 50–60 %, in stanejo 1,5 milijarde EUR. Zdravljenje biofilmskih okužb je kompleksno, saj zahteva visoke in potencialno toksične odmerke antibiotikov. Ostanki hrane na površinah spodbujajo tvorbo biofilmov, ki predstavljajo 80 % bakterijskih okužb. Tvorba biofilma je ključni prilagoditveni mehanizem za preživetje tudi odpornih sevov [2,3].

Osrednji cilj projekta mladega raziskovalca bo raziskovanje biofilmov ter mehanizmov, ki omogočajo in spodbujajo razvoj odpornih celic, ter modulacija prisotnosti bakterij zaradi kritičnih pogojev v živilski verigi kot posledica obdelave živil, prisotne mikrobne združbe ter odpornosti bakterij *Campylobacter.* Izhodišče bodo predhodno postavljene metode kvantifkikacije v biofilmih [4], raziskave mehanizmov odpornosti kampilobaktrov, kolonizacija biotskih/abiotskih površin [5,6], mikrobne interakcije [7], kar sovpada z raziskovalno temo PS Mikrobiologija in biotehnologija živil in okolja.

Fokus projekta mladega raziskovalca bo raziskovanje mehanizmov adhezije, interakcije in prenosa/razvoja odpornosti (npr. izlivne črpalke, prenos genov) bakterij *Campylobacter v* enovrstnih ter večvrstnih biofilmih. Celosten pristop bo vključeval raziskave na nivoju genskih informacij (npr. horizontalni prenos genov, analiza genov z orodji bioinformatike) ter fiziološkega odziva celice (npr. zunajcelični matriks, gibljvost, odpornost). Tematika povezuje aktualne projekte, programsko skupino ter odlične slovenske in tuje raziskovalce. Rezultat bodo nova znanstvena dognanja o premalo raziskanih kampilobaktrih ter obliki biofilma. Pri obdelavi podatkov bomo uporabili bioinformatiko ter identificirali ključne gene moduliranih mehanizmov. V nadaljevanju se bomo usmerili tudi na protibiofilmske učinkovine, specfiične za pridobljene tarče znotraj/zunaj celice, ter izpostavili ključne tarče za učinkovit nadzor bakterij *Campylobacter*.

Zaželena je samostojnost in motiviranost za raziskovalno delo na področju mikrobiologije, dobro razvite komunikacijske in organizacijske sposobnosti, delovne izkušnje v laboratoriju z bakterijami ter znanje angleškega jezika. Zaželena so tudi bolj specifična znanja, potrebna pri delu s patogenimi bakterijami ter analiza podatkov z uporabo statističnih in računalniških orodij, vključno z osnovami bioinformatike.

1. WHO (2023): https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance
2. WHO (2024): https://www.who.int/news-room/detail/29-04-2019-new-report-calls-for-urgent-action-to-avert-antimicrobial-resistance-crisis
3. Klančnik s sod. (2020) Anti-adhesion activity of phytochemicals to prevent *Campylobacter jejuni* biofilm formation on abiotic surface. Photochemistry Reviews, DOI: 10.1007/s11101-020-09669-6
4. Čukajne s sod. (2024). Holistic monitoring of *Campylobacter jejuni* bioflms with NanoLuc bioluminescence. *Applied Microbiology and Biotechnology,* DOI: 10.1007/s00253-024-13383-0

5. Jug s sod. (2024). Modulation of *Campylobacter jejuni* adhesion to biotic model surfaces by fungal lectins and protease inhibitors. *Frontiers in Cellular and Infection Microbiology,* DOI: 10.3389/fcimb.2024.1391758
6. Pavlinjek s sod. (2024). Evaluation of physical and chemical isolation methods to extract and purify *Campylobacter jejuni* extracellular polymeric substances. *Frontiers in microbiology*, DOI: 10.3389/fmicb.2024.1488114
7. Klančnik s sod. (2024). The antibacterial potential and effects of *Rhodiola* sp. on gut microbiota. *Phytochemistry reviews,* DOI: 10.1007/s11101-024-09965-5

Eng.:

The research topic focusses on the current problem in the food supply chain - the production of sustainable and safe food. The focus is on the resistance of pathogenic bacteria that are transmitted through food and pose a threat to public health due to their constant contamination and recurrent infections. The research model will focus on *Campylobacter* spp. which are the main cause of gastrointestinal infections in industrialised countries. The "Global Action Plan on Antimicrobial Resistance" and the "One Health" approach [1] will guide the development of new methods, alternative ways to control contamination and/or treat infections. **In addition to antimicrobial resistance, one of the resistance mechanisms is biofilm, which protects bacteria from unfavourable environmental factors and the host's immune response**. **Microbial resistance** is a growing problem in healthcare, agriculture, food production and the environment. Due to the overuse of antibiotics and the slow development of alternatives, it will become the leading cause of death worldwide, costing up to USD 35 billion annually [2]. **Biofilms** are microbial communities on surfaces surrounded by an extracellular matrix that prevents the penetration of inhibitors [3]. Biofilms cause 4 million infections and 40,000 deaths per year in the EU, with a mortality rate of 50–60%, at a cost of EUR 1.5 billion. The treatment of biofilm-associated infections is complex as it requires high and potentially toxic doses of antibiotics. Food residues on surfaces promote biofilm formation and are responsible for 80% of bacterial infections. Biofilm formation is an important adaptation mechanism for the survival of even resistant strains [2,3].

The main objective of the young researcher project will be to investigate biofilms and the mechanisms that enable and promote the development of resistant cells, as well as the modulation of bacterial presence by critical conditions in the food supply chain resulting from food processing, existing microbial communities and the resistance of *Campylobacter*. Starting points are already established methods for quantification in biofilms [4], studies on resistance mechanisms of *Campylobacter*, colonization of biotic/abiotic surfaces [5,6] and microbial interactions [7], which coincides with the research topic of the Microbiology and Biotechnology of Food and Environment program.

The main focus of the young researcher project will be to investigate the mechanisms of adhesion, interaction and transfer/evolution of resistance (e.g. efflux pumps, gene transfer) in *Campylobacter* within single or multi-species biofilms. A comprehensive approach includes research at the level of genetic information (e.g. horizontal gene transfer, gene analysis using bioinformatic tools) and cellular physiological response (e.g. extracellular matrix, motility, resistance). The topic connects ongoing projects, the program group and outstanding Slovenian and international researchers. The results will provide new scientific insights into previously little studied *Campylobacter* and biofilm forms. Bioinformatics will be used in data processing to identify key genes for modulated mechanisms. In the future, the project will also focus on anti-biofilm agents specific to the identified targets inside/outside the cell, highlighting important targets for effective control of *Campylobacter*.

Desired are independence and motivation for research in the field of microbiology, strong communication and organizational skills, work experience in a laboratory with bacteria and knowledge of the English language. More specific skills required for working with pathogenic bacteria and data analysis using statistical and computational tools, including the basics of bioinformatics, are also desirable.

1. WHO (2023): https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance
2. WHO (2024): https://www.who.int/news-room/detail/29-04-2019-new-report-calls-for-urgent-action-to-avert-antimicrobial-resistance-crisis
3. Klančnik s sod. (2020) Anti-adhesion activity of phytochemicals to prevent *Campylobacter jejuni* biofilm formation on abiotic surface. Photochemistry Reviews, DOI: 10.1007/s11101-020-09669-6
4. Čukajne s sod. (2024). Holistic monitoring of *Campylobacter jejuni* bioflms with NanoLuc bioluminescence. *Applied Microbiology and Biotechnology,* DOI: 10.1007/s00253-024-13383-0
5. Jug s sod. (2024). Modulation of *Campylobacter jejuni* adhesion to biotic model surfaces by fungal lectins and protease inhibitors. *Frontiers in Cellular and Infection Microbiology,* DOI: 10.3389/fcimb.2024.1391758
6. Pavlinjek s sod. (2024). Evaluation of physical and chemical isolation methods to extract and purify *Campylobacter jejuni* extracellular polymeric substances. *Frontiers in microbiology*, DOI: 10.3389/fmicb.2024.1488114
7. Klančnik s sod. (2024). The antibacterial potential and effects of *Rhodiola* sp. on gut microbiota. *Phytochemistry reviews,* DOI: 10.1007/s11101-024-09965-5

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☐ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☐ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☐ **nagrade** *(awards (e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☐ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Ines Mandić Mulec, ines.mandicmulec@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

Mikrobiologija (Microbiology)

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.:
Mladi raziskovalec/raziskovalka bo imel priložnost sodelovati v dinamičnem, interdisciplinarnem in mednarodno vpetem timu, ki deluje v okviru Katedre za mikrobno ekologijo in fiziologijo, Oddelka za mikrobiologijo, Biotehniške fakultete, kjer raziskujemo »socialne« interakcije mikroorganizmov v večceličnih skupnostih- biofilmih. Naš cilj je razumeti molekularne mehanizme, ekologijo in evolucijo mikrobnega komuniciranja, sodelovanja, tekmovanja, mikrobnih vojn in posledično morebitnega razvoj odpornosti na napad. V programski skupini je na voljo vrhunska raziskovalna oprema, ki omogoča pogubljeno raziskovanje medceličnih interakcij: npr. konfokalna in super resolucijska mikroskopija, pretočna citometrija, fluorometrija, celično sortiranje, meritve v večnamenskih čitalcih (npr, OD, fluroescence), metode genetike, rekombinantne DNK, mikrofluidike, znanja bioinformatike, primerjalne genomike. Na voljo je tudi bogata zbirka mikroorganizmov, rekombinatnih sevov ter eksperimentalnih modelnih sistemov za študij mikrobne socialnosti. Raziskujemo socialne odnose mikroorganizmov na nivoju molekul, posamezne celice, populacije in združbe. Rezultate objavljamo v vrhunskih znanstvenih revijah ter razvijamo temeljna in uporabna znanja na področju mikrobiologije.

Kratka vsebina projekta mladega raziskovalca: Eden največjih problemov današnjega časa je razvoj odpornosti na antibiotike patogenih mikroorganizmih, ki jo spodbujamo s prekomerno uporabo antibiotikov. Zato danes iščemo nove rešitve tega problema med katere uvrščamo tudi probiotike (koristne mikroorganizme), ki so vse več v uporabi kot prehranski dodatki za ljudi in živali. Ali in kako probiotiki vplivajo na prenos/razvoj odpornost na antibiotike pri patogenih bakterijah in kako patogene bakterije vplivajo na produkcijo antibiotikov pri probiotiku, je slabo raziskano. Glavni cilj doktorske naloge bo raziskati s pristopi eksperimentalne evolucije kako dolgotrajna kokultivacija probiotika (Bacillus subtilis) in patogena (npr. iz rodu Salmonella, Campylobacter) vpliva na socialne odnose dveh bakterij. Mladi raziskovalec bo sledil spremembam obeh bakterijskih vrst v kokulturi oz monokulturi skozi čas in to na nivoju genoma in različnih fenotipov: npr. izražanja genov, virulence, biofilma, vpliva na črevesni epitel (tkivna kultura) in drugih relevantnih fenotipov.

Prednosti bodo imeli kandidati/kandidatke, ki imajo izkušnje na področju mikrobiologije, močno željo, da razumejo evolucijo in mikrobne interakcije, izkušnje na tem področju, že obvladajo ali se naučijo bioinformatike, odlično znanje govornega in pisnega angleškega jezika (obvezno) in izkušnje z relevantnimi metodami.

Eng.:
The young researcher will be a member of a dynamic, interdisciplinary and internationally integrated team that works within the Department of Microbial Ecology and Physiology, Department of Microbiology, Faculty of Biotechnology. We investigate the "social" interactions of microorganisms in multicellular communities - biofilms. Our goal is to understand the molecular mechanisms, ecology and evolution of microbial communication, cooperation, competition and antagonism. In the program group, top-notch research equipment is available, which enables the in-depth research of molecular mechanisms driving microbial sociality. Laboratories are equipped with confocal and super-resolution microscopy, flow cytometry, cell sorting, multimode readers (for OD and fluorescence measurements etc), We apply methods of genetics, recombinant DNA, microfluidics, bioinformatics - comparative genomics. In addition, a rich collection of microorganisms including recombinant strains and models based on tissue cultures are available. Hence, we are able to experimentally address microbial sociality at the level of molecules, individual cells, populations and communities. We publish the results in top scientific journals and develop fundamental and useful knowledge in the field of microbiology.

Brief content of the young researcher's project: One of the biggest problems of today is the development of antibiotic resistance in pathogenic bacteria, which is encouraged by the excessive use of antibiotics. That is why new solutions are urgently needed and application of probiotics (beneficial microorganisms) is offering a potential solution. Probiotics are increasingly being used as nutritional supplements for humans and animals. However, whether and how probiotics affect the transmission/development of antibiotic resistance in pathogenic bacteria and how pathogenic bacteria affect antibiotic production by the probiotic strains is poorly understood. The main goal of the doctoral thesis will be to investigate how long-term co-cultivation of a probiotic (Bacillus subtilis) and a pathogen (e.g., from the genus Salmonella or Campylobacter) influence social traits including antibiotic resistance. The PhD candidate will apply methods of experimental evolution and various experimental model system that are used in the group to describe relevant genotypes and phenotypes in evolved bacteria.

Candidates with experience in the field of microbiology, microbial interactions will have an advantage, also the wish to learn bioinformatics is a plus and those with experience with relevant methods will have advantages. Excellent knowledge of the English language is a must.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☒ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☒ **nagrade** *(awards (e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☒ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☒ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta (*Biotechnical faculty*)

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Jana Murovec, jana.murovec@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

Rastlinska biotehnologija (*Plant biotechnology*)

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.:
Usposabljanje mladega raziskovalca bo potekalo na Katedri za genetiko, biotehnologijo, statistiko in žlahtnjenje rastlin Oddelka za agronomijo, Študija biotehnologije, Biotehniške fakultete Univerze v Ljubljani v okviru programske skupine P4-0077 Kmetijske rastline - genetika in sodobne tehnologije.

Program usposabljanja bo s področja biotehnologije, žlahtnjenja in genetike konoplje (*Cannabis sativa* L.). Konoplja je namreč gospodarsko vedno bolj pomembna rastlinska vrsta s široko uporabo v farmaciji, kozmetiki, prehrani in trajnostnem kmetijstvu. Vendar je njeno žlahtnjenje počasno zaradi omejitev klasičnih žlahtniteljskih metod. Raziskave v okviru doktorskega usposabljanja bodo zato namenjene vzpostavitvi učinkovitih protokolov za sodobne, biotehnološke pristope žlahtnjenja konoplje. Delo bo vključevalo gojenje rastlin konoplje *in vitro* v tkivnih kulturah (mikropropagacija in druge tehnike), genske transformacije konoplje, optimizacijo regeneracije *in vitro* iz različnih celičnih/tkivnih tipov, preurejanje genoma konoplje, laboratorijske genetske analize (kloniranje, PCR, qPCR, sekvenciranje, pretočna citometrija), uporabo bioinformacijskih orodij za analizo podatkov ter oskrbo matičnih rastlin. Natančen program usposabljana z vsebino doktorata ter potek samega doktorskega študija bosta natančno definirana in dorečena skupaj z izbranim MR.

Iščemo kandidata, ki želi prispevati k razvoju novih tehnologij za žlahtnjenje rastlin ter sodelovati pri raziskavah s področij rastlinskih tkivnih kultur, sodobnih tehnologij genskih transformacij in metod preurejanja genomov rastlin (CRISPR/Cas9) konoplje. Prednost bodo imeli kandidati z zaključeno magistrsko izobrazbo s področja biotehnologije, agronomije, hortikulture, molekularne biologije, mikrobiologije ali sorodnih ved. Zaželeni so: dobro znanje angleškega jezika, predhodno sodelovanje v raziskovalnem delu ter sposobnost samostojnega dela.

Poleg doktorskega študija bodo naloge kandidata:
- sodelovanje pri raziskovalnem delu vezanem na temo kandidatovega doktorskega dela,
- sodelovanje pri pedagoškem delu,
- predstavitve rezultatov doktorske raziskave na domačih in tujih konferencah in v znanstvenih objavah.

Eng.:
The training of the young researcher will take place at the Chair of Genetics, Biotechnology, Statistics and Plant Breeding within the Department of Agronomy, Study of Biotechnology, Biotechnical Faculty, University of Ljubljana, as part of the research program P4-0077 Agricultural Plants – Genetics and Modern Technologies of Crops.

The training program will focus on the biotechnology, breeding, and genetics of cannabis (*Cannabis sativa* L.), a plant species of growing economic importance with diverse applications in pharmaceuticals, cosmetics, nutrition, and sustainable agriculture. However, cannabis breeding is a slow process due to the limitations of classical breeding methods. Therefore, the doctoral research within this training will aim to establish efficient protocols for modern biotechnological approaches in cannabis breeding.

The work will include: *in vitro* tissue culture of cannabis plants (micropropagation and other techniques), genetic transformation of cannabis, optimization of *in vitro* regeneration from various cell/tissue types, genome editing of cannabis, laboratory genetic analyses (cloning, PCR, qPCR, sequencing, flow cytometry), application of bioinformatics tools for data analysis, maintenance of mother plants. The exact training program, including the

doctoral research content and study plan, will be precisely defined in agreement with the selected young researcher.

We are looking for a candidate interested in developing new plant breeding technologies and contributing to research in plant tissue cultures, modern genetic transformation technologies, and genome editing methods (CRISPR/Cas9) in cannabis.

Preferred qualifications are a Master's degree in biotechnology, agronomy, horticulture, molecular biology, microbiology, or related fields, proficiency in English, previous research experience, ability to work independently.

In addition to doctoral studies, the candidate's tasks will include:
- Participation in research work related to her/his doctoral dissertation,
- Involvement in teaching activities,
- Presentation of doctoral research results at national and international conferences and in scientific publications.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☒ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

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☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **druge priloge po izbiri kandidata, kot npr. opis dosedanjega sodelovanja pri raziskovalnem delu, priporočilno pismo, bibliografija, prejete nagrade** *(other attachments)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Univerza v Ljubljani, Biotehniška fakulteta, Jamnikarjeva 101, SI-1000 Ljubljana *(University of Ljubljana, Biotechnical Faculty, Jamnikarjeva 101, SI-1000 Ljubljana)*

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

MONIKA NOVAK BABIČ, monika.novakbabic@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

3.01.00 - Medicina, Mikrobiologija in imunologija *(3.01.00 - Medical sciences, Microbiology and immunology)* 1.06 – Biologija *(1.06 – Biological sciences (excluding medical and agricultural sciences))*

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Zaradi hitrih globalnih sprememb se v svetu pojavljajo novi patogeni mikroorganizmi. WHO je leta 2022 izdala dokument s seznamom porajajočih glivnih patogenov s pozivom k spremljanju sevov gliv iz okolja. Njihov patogeni potencial, ki pogosto vključuje tudi odpornost proti antimikotikom, namreč predstavlja naraščajoče globalno breme za zdravje ljudi. Voda je eno izmed okolij, ki služijo kot vektor za prenos gliv. Čeprav je njihova prisotnost v pitni vodi znana, se glive v predpisih o pitni vodi še ne obravnavajo kot mikrobiološki parameter. Zaradi pomanjkanja znanja o glivah v vodi in na materialih v stiku z vodo, tudi ni na voljo podatkov o pojavu porajajočih se patogenih gliv v vodnih aerosolih. Prav tako ni podatkov o glivah iz vode, ki so že razvile rezistenco na antimikotike. Med temi predstavljata glavno grožnjo rodova Candida in Aspergillus. Predvsem slednji zelo hitro razvija rezistenco na azole, ki bi v kombinaciji z vsakodnevno uporabo vode in enostavnim prenosom preko aerosolov globoko v dihala, predstavljala tveganje za hude okužbe pri imunsko oslabljenih ljudeh in dolgotrajno hospitaliziranih bolnikih. Doktorsko delo bo potekalo na Biotehniški fakulteti (UL, Ljubljana, Slovenija), kjer bo mladi raziskovalec preučeval prisotnost in število porajajočih se glivnih patogenov v vodi, na materialih v stiku z vodo in v razpršenih aerosolih, ki posnemajo realne razmere med prhanjem. V dogovoru z izbrano kliniko bo vzorčenje izvajal mesečno, 12 mesecev, v določenih kliničnih prostorih, kjer se dlje časa zadržujejo osebe s težjimi pljučnimi obolenji. Pridobljene seve gliv iz rodov Candida in Aspergillus bo testiral na odpornost proti antimikotikom. Podatke, pridobljene med raziskavo bo ovrednotil z ustreznimi statističnimi analizami. Rezultati doktorske disertacije bodo celovito obravnavali zdravstvena tveganja v kliničnem okolju, ki jih predstavljajo glive iz vodovodne vode, biofilmi in aerosoli, vključno z napovedjo sezonskega pojavljanja, številčnosti in raznolikosti nastajajočih in odpornih gliv, ki se prenašajo z vodo in z aerosoli razpršijo v klinično okolje. Mladi raziskovalec bo med doktoratom s pomočjo gojitvenih in molekularno-genetskih pristopov pridobil znanje o taksonomiji in raznolikosti gliv ter ugotavljal odpornost proti komercialno dostopnim antimikotikom. Poleg tega se bo kandidat naučil statistično ovrednotiti pridobljene rezultate in vzpostaviti napovedne modele z metodo strojnega učenja. Mladega raziskovalca bomo spodbujali, da pridobljeno znanje podaja na znanstvenih konferencah in v objavljeni znanstveni literaturi. Zaradi specifičnosti raziskovalnega programa in zahtevanega osnovnega ali naprednega znanja standardnih mikrobioloških metod, bodo pri izbiri imeli prednost kandidati z magisterijem iz mikrobiologije, biologije, biotehnologije, farmacije ali medicine.

Eng.: Due to rapid global changes new pathogens emerge worldwide. In 2022 WHO issued a document with a list of emerging fungal pathogens with the appeal to monitor wild strains of fungi from the environment, since their pathogenic potential, including antimycotic resistances, became a global burden for human health. Water is one environment that serves as a vector for fungal transmission. Although the presence of fungi in drinking water is

known, fungi are not yet considered a microbiological parameter in drinking water regulations. Due to the lack of knowledge on fungi in water and biofilms on materials, also no data is available on the occurrence of emerging fungi in aerosols and the possible selection of fungi that have already developed resistance to antimycotics. Among these, the main problem represent the genera Candida and Aspergillus. Particularly, the latter is very rapidly exhibiting azole resistance, which, combined with the daily use of water and easy transfer via aerosols deep into the respiratory system, pose a risk for severe infections in immunocompromised people and long-time hospitalized patients.

PhD work will be carried out at the Biotechnical Faculty (UL, Ljubljana, Slovenia) where the young researcher will investigate the burden of emerging fungi in drinking water, on materials in contact with water, and in dispersed aerosols mimicking the real conditions during showering. In agreement with the clinical hospital, sampling will be carried out monthly for 12 months in the selected clinical rooms, where people with serious pulmonary conditions stay prolonged time. Obtained fungal strains of the genera Candida and Aspergillus will be additionally tested for antimycotic resistances. Data gained through the study will be assessed with the relevant statistical analyses. The results of the doctoral thesis will comprehensively address the health risks in the clinic environment, posed by fungi from tap water, biofilms, and aerosols, including the prediction of the seasonal occurrence, abundance and diversity of emerging and resistant fungi transferred by water and dispersed via aerosols into the clinical environment.

During the PhD, the young researcher will use cultivable and molecular-genetic approaches to gain knowledge on fungal taxonomy and diversity, as well as to determine the resistance to antimycotics. In addition, the candidate will learn to statistically evaluate the obtained results and to establish machine-learning predictive models. Young researcher will be encouraged to disperse the obtained knowledge at scientific conferences and in published manuscripts.

Due to the specifics of the research programme, and the required basic/advanced knowledge of standard microbiological methods, the preferred candidates would be those with master's degrees from the fields of microbiology, biology, biotechnology, pharmacy, or medicine.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☒ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **druge priloge** *(other attachments)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Primož Oven, primoz.oven@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

4.01.02 Biotehnika / Gozdarstvo, lesarstvo in papirništvo / Lesarstvo

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Splošno. Kandidat/ka bo vključen/a v raziskovalno skupino (P4-0015) Les in lignocelulozni kompoziti. Deloval/a bo v Katedri za kemijo lesa in druge lignocelulozne materiale, kjer potekajo raziskave na področju valorizacije in biorafinacije lesne biomase in razvoju bio-osnovanih kompozitov. Del raziskav bo izveden tudi v tujini.

Uvod. Les je hierarhično organiziran polimerni kompozit celuloze, hemiceluloz, lignina in ekstracelularnih ekstraktivov, zato predstavlja primerno surovino tudi za proizvodnjo naprednih bio-osnovanih materialov. Mednje sodijo tudi nanostrukturirani gradniki, med katerimi zaradi uporabnosti izstopa nanoceluloza (NC) v obliki nanofibril in nanokristalov, v to skupino pa lahko uvrščamo tudi lignocelulozne nanofibrile. Različne vrste NC je mogoče pridobiti iz različnih ligno-celuloznih virov, običajno po zaporednih procesnih fazah, ki vključujejo, pripravo in čiščenje surovine, predobdelavo, glavni proces defibrilacije in postobdelavo. Ker se za pridobivanje NC izkoriščajo različne kombinacije surovin in postopkov, je mehanizem razklopa vlaken še vedno fragmentarno preiskan saj manjkajo podatki o vplivu posameznega procesa na morfologijo in druge lastnosti NC. Razumevanje teh mehanizmov bi omogočilo optimizacijo postopkov za proizvodnjo večjih količin NC, doseganje višjih TRL, obenem pa bi omogočilo prilagoditev procesov za proizvodnjo točno določnega tipa NC, kar je izredno pomembno z vidika diverzifikacije uporabe NC.

Cilj programa je razvoj in optimizacija štirih procesnih sklopov za pridobivanje NC delcev, lignoceluloznih nanofibril in celuloznih nanofibril, iz nativne, kemično in encimatsko obdelane vhodne surovine z dvema tehnikama defibrilacije (homogenizacija, ultrafino mletje). Za pridobivanje lignoceluloznih nanofibril bosta kot modelni vrsti služila les bukovine in smrekovine, ki se pomembno razlikujeta v lastnostih, CNF pa bomo pridobivali iz dveh vrstah kraft celuloze, s kratkimi in dolgimi vlakni. Za vse faze raziskave bodo materiali ustrezno predpripravljeni (npr. mletje, razpuščanje, itd.). Mehanska defibrilacija bo izpeljana z dvema postopkoma, homogenizacijo in ultra finim mletjem. Kot referenčni postopek bo vedno služila mehanska defibrilacija nativne surovine. Za kemično predobdelavo bo uporabljen postopek esterifikacije in oksidacije. Surovina bo obdelovana tudi z globokimi evtektičnimi topili (DES) pri čemer so možni kandidati DES na osnovi holin klorida in karboksilnih kislin. Zadnji sklop predobdelave bo blaga encimska hidroliza, ki bo temeljila na komercialno dostopnih lignolitičnih in celulitičnih encimih. Karakterizacija vmesnih in končnih produktov bo med drugim vključevala SEM, TGA, DSC, FTIR, XRPD.

Delovne hipoteze. Predpostavlja se, da bi bilo mogoče celulozne nanodelce pridobiti z ustrezno kombinacijo homogenizacije in ultrafinega mletja brez kemične ali encimske predobdelave. Obenem pa lahko domnevamo, da kemična ali encimatska predobdelava izboljša kakovost končnega produkta in zmanjša porabo energije in časa obdelave.

Prispevek k znanosti. Poleg optimizacije procesov za doseganje ciljanih končnih produktov NC bo izvirni prispevek k znanosti razumevanje mehanizma defibrilacije, kar bo osnova za razvoj mehanicističnega modela razklopa za vsak procesni niz.

General. The candidate will be included in the research group (P4-0015) Wood and Lignocellulosic Composites. He/she will work in the Department of Chemistry of Wood and Other Lignocellulosic Materials, where research is conducted in the field of valorization and biorefining of wood biomass and the development of bio-based composites. Part of the research will also be conducted abroad.

Introduction. Wood is a hierarchically organized polymer composite of cellulose, hemicelluloses, lignin and extracellular extractives, and therefore represents a suitable raw material for the production of advanced bio-based materials. These also include nanostructured building blocks, among which nanocellulose (NC) in the form of lignocellulose nanofibrils, nanofibrils and nanocrystals stands out due to its applicability. Different types of NC can be obtained from different ligno-cellulose sources, usually after sequential process phases, which include raw material preparation and purification, pretreatment, the main defibrillation process and post-treatment. Since different combinations of raw materials and processes are used to obtain NC, the mechanism of fiber decomposition is still fragmentarily investigated, as data on the influence of each individual process on the morphology and other properties of NC are lacking. Understanding these mechanisms would enable optimization of processes for the production of larger quantities of NC, achieving higher TRLs, and at the same time would enable the adaptation of processes for the production of a specific type of NC, which is extremely important from the perspective of diversifying the use of NC.

The aim of the program is to develop and optimize four process sets for obtaining NC particles, lignocellulosic nanofibrils and cellulose nanofibrils, from native, chemically and enzymatically treated input raw materials using two defibrillation techniques (homogenization, ultrafine grinding).
For the production of lignocellulosic nanofibrils, beech and spruce wood, which differ significantly in properties, will serve as model species, while cellulose nanofibrills will be obtained from two types of kraft cellulose, with short and long fibers. For all phases of the research, the materials will be appropriately pre-prepared (e.g. grinding, dissolution, etc.). Mechanical defibrillation will be performed using two processes, homogenization and ultrafine grinding. Mechanical defibrillation of the native raw material will always serve as the reference process. The esterification and oxidation process will be used for chemical pre-treatment. The raw material will also be treated with deep eutectic solvents (DES), with possible DES candidates based on choline chloride and carboxylic acids. The final set of pretreatment will be mild enzymatic hydrolysis based on commercially available lignolytic and cellulolytic enzymes. Characterization of intermediate and final products will include SEM, TGA, DSC, FTIR, XRPD, among others.

Working hypotheses. It is assumed that cellulose nanoparticles could be obtained by an appropriate combination of homogenization and ultrafine grinding without chemical or enzymatic pretreatment. At the same time, it can be assumed that chemical or enzymatic pretreatment improves the quality of the final product and reduces energy consumption and processing time.

Contribution to science. In addition to optimizing processes to achieve targeted NC end products, an original contribution to science will be the understanding of the defibrillation mechanism, which will be the basis for developing a mechanistic decomposition model for each process sequence.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☒ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☒ **nagrade** *(awards (e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☒ **priporočilno pismo** *(letter of recommendation)*

☒ **druge priloge** *(other attachments)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Tatjana Pirman, tatjana.pirman@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

Prehrana

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Prehrana domačih živali je ključnega pomena za njihovo zdravje in dobro počutje, vendar se pojavlja več izzivov, ki vplivajo na njeno kakovost. V raziskovalnem delu bomo proučili najpomembnejše prehranske izzive pri rejnih živalih in izbrali najbolj aktualno temo za podrobnejšo analizo.

Pri rejnih živalih ima prehrana neposreden vpliv na produktivnost, zdravje in dobrobit, hkrati pa določa kakovost končnih izdelkov, kot so mleko, meso in jajca. Eden ključnih izzivov je iskanje alternativnih virov beljakovin, ki bi zmanjšali odvisnost od soje, saj je ta vedno bolj povezana z etičnimi in okoljskimi vprašanji. Med perspektivne alternative spadajo insektna biomasa, alge, enocelične beljakovine ter stranski proizvodi živilske industrije, kot so sončnične in repične tropine.

Prehrana rejnih živali vpliva tudi na okolje, zlasti zaradi emisij toplogrednih plinov, predvsem metana pri prežvekovalcih. Možnosti za zmanjšanje okoljskega vpliva vključujejo dodajanje taninov in alg za omejitev metana, optimizacijo prehrane z nižjo vsebnostjo prebavljivih beljakovin ter precizno krmljenje za zmanjšanje izgub hranil.

Poleg tega je vse več poudarka na zmanjšanju uporabe antibiotikov, saj postaja odpornost proti njim globalna težava. Alternativne rešitve vključujejo probiotike, prebiotike in imunomodulatorje, kot so beta-glukani, ki krepijo naravno odpornost živali.

Pomemben izziv ostaja tudi kakovost in stabilnost krme, saj lahko kontaminacija z mikotoksini negativno vpliva na zdravje in rast živali. Težavo je mogoče omiliti z uporabo vezalcev mikotoksinov, izboljšanim shranjevanjem krme ter vključevanjem fermentiranih živilskih stranskih produktov, ki prispevajo k njeni stabilnosti in hranilni vrednosti.

Nenazadnje ima prehrana ključno vlogo pri dobrobiti živali, njihovem vedenju in obvladovanju stresa. Dodajanje omega-3 maščobnih kislin ter probiotikov in prebiotikov lahko izboljša črevesno zdravje in stabilizira mikrobiom prebavil, ki je tesno povezan z osjo črevesje-možgani. Ta povezava postaja vse bolj aktualna tudi pri rejnih živalih, saj vpliva na njihovo vedenjsko in nevrološko stanje.

Raziskovalno delo bo osredotočeno na iskanje inovativnih prehranskih rešitev, ki bodo prispevale k trajnostni, učinkoviti in okolju prijazni živinoreji.

Eng.: Animal nutrition is crucial for their health and well-being, but several challenges affect its quality. In this research, we will examine the most pressing nutritional issues in livestock and select the most relevant topic for the analysis.

In livestock production, nutrition directly impacts productivity, health, and welfare, while also determining the quality of final products such as milk, meat, and eggs. One of the key challenges is finding alternative protein sources to reduce dependence on soybean, which is increasingly linked to ethical and environmental concerns. Promising alternatives include insect biomass, algae, single-cell proteins, and by-products of the food industry, such as sunflower and rapeseed meal.

Animal nutrition also affects the environment, particularly through greenhouse gas emissions, mainly methane from ruminants. Potential solutions include adding tannins and algae to reduce methane production, optimizing diets with lower digestible protein content, and precision feeding to minimize nutrient losses.

Additionally, there is a growing emphasis on reducing antibiotic use, as antimicrobial resistance is a global concern. Alternative approaches include probiotics, prebiotics, and immunomodulators such as beta-glucans, which enhance the animals' natural immunity.

Another major challenge is feed quality and stability, as contamination with mycotoxins can negatively affect animal health and growth. This issue can be mitigated by using mycotoxin binders, improving feed storage conditions, and incorporating fermented food industry by-products, which contribute to feed stability and nutritional value.

Finally, nutrition plays a vital role in animal welfare, behavior, and stress management. Supplementing diets with omega-3 fatty acids and probiotics and prebiotics can improve gut health and stabilize the gut microbiome, which is closely linked to the gut-brain axis. This connection is becoming increasingly relevant in livestock, as it influences behavioural and neurological functions.

This research will focus on identifying innovative nutritional solutions that contribute to sustainable, efficient, and environmentally friendly livestock production

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☒ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☒ **nagrade** *(awards (e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta (*Biotechnical faculty*)

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Nataša Poklar Ulrih, natasa.poklar@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

Razvoj tehnoloških postopkov za kapsulacijo eteričnih olj (Development of technological processes for Encapsulation of essential oils) ARIS: 4.06.06 Zaključni procesi v biotehnologiji (Final processes in biotechnology)

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Iščemo mladega raziskovalca za delo na inovativnem projektu, osredotočenem na kapsulaciji eteričnih olj z namenom njihove uporabe v živilski industriji in embalažnih materialih. Cilj raziskave je razvoj naprednih mikrokapsulacijskih sistemov, ki omogočajo stabilizacijo eteričnih olj ter njihovo nadzorovano sproščanje, kar podaljšuje njihovo funkcionalnost in učinkovitost. Naloge vključujejo: - Razvoj in optimizacijo različnih kapsulacijskih postopkov kot so sušenje z razprševanjem ali zamrzovanjem. - Preučevanje različnih stenski materialov in njihovih učinkov na zaščito ter sproščanje bioaktivnih spojin. - Karakterizacijo mikrostrukturiranih kapsul s pomočjo Ramanove spektroskopije, termogravimetrične analize (TGA), diferenčne dinamične kalorimetrije (DSC) in drugih analitskih metod. - Določanje struktur in spremljanje strukturnih sprememb na vrstičnem elektronskem mikroskopu (SEM) - Vrednotenje fizikalno-kemijskih lastnosti kapsul ter njihove funkcionalnosti v končnih aplikacijah.

Eng.: We are looking for a young researcher to work on an innovative project focusing on the encapsulation of essential oils for use in the food industry and packaging materials. The aim of the research is to develop advanced microencapsulation systems that allow the stabilisation of essential oils and their controlled release, thus prolonging their functionality and efficacy. Tasks include: - Development and optimisation of different encapsulation processes such as spray drying or freeze drying. - Study of different wall materials and their effects on the protection and release of bioactive compounds. - Characterisation of microstructured capsules by Raman spectroscopy, thermogravimetric analysis (TGA), differential dynamic calorimetry (DSC) and other analytical methods. - Determination of structures and monitoring of structural changes on the scanning electron microscope (SEM) - Evaluation of the physicochemical properties of capsules and their functionality in end-use applications. - Development of a method for the release of essential oils from capsules.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)* ☒ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

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☒ **nagrade** *(awards (e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Bitehniška fakulteta / Biotechnical faculty

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Tomaž Polak; tomaz.polak@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

4.02; Biotehnika; Živalska produkcija in predelava; Mikotoksini 4.02; Biotechnical sciences; Animal production; Mycotoxins

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.:

V našo ekipo sprejmemo **doktorskega kandidata**, ki se bo pripravljen vključiti v raziskave na področju **proučevanja mikotoksinov v modelnih sistemih in mesnih izdelkih**. V raziskavi se bomo ukvarjali predvsem z raziskovanjem vpliva okoljskih dejavnikov na modelnih sistemih in na realnih vzorcih. Modelni poskusi bodo bili opravljeni na trdnih in tekočih gojiščih, ugotovitve pa bomo aplicirali na realne vzorce, predvsem salame narejene na slovenskih kmetijah. Prav tako bomo proučevali morebitni zaviralni učinek starterskih kultur. Študija bo obravnavala več ciljev trajnostnega razvoja, ki so tudi del **nekaterih globalnih ciljev, določenih pri Združenih narodih**; Cilj 2 – Odprava lakote, Cilj 3 – Zdravje in dobro počutje, Cilj 12 – Odgovorna poraba in proizvodnja ter Cilj 13 – Podnebni ukrepi. Z izvedeno študijo bomo pomembno prispevali k bolj trajnostni in odporni verigi preskrbe s hrano.

Večina raziskovalnega dela bo potekala v laboratoriju, posvetili pa se bomo tudi analitiki mikotoksinov (LC-MS/MS). Kandidat bo imel tekom zaposlitve možnost gostovanja v tujini. Glede na to, da bo kandidat zaposlen na Katedri za tehnologijo mesa in vrednotenje živil, bo njegovo delo vključevalo tudi senzorično ocenjevanje mesa in mesnih izdelkov, vključno s svinjino.

Naloge kandidata in pogoji za zaposlitev:

- izpolnjevanje obveznosti doktorskega študija;
- **zaželene izkušnje in veselje do dela v laboratoriju** ter poznavanje osnov tekočinske kromatografije;
- sodelovanje v skupini – timsko delo;
- prednost bodo imeli kandidati s predznanjem na področju živilstva.

Eng.: We are looking for **a PhD candidate** to join our team and participate in research on **the study of mycotoxins in model systems and meat products**. Our research will focus primarily on investigating the impact of environmental factors in model systems and real samples. Model experiments will be conducted on solid and liquid media, and the findings will be applied to real samples, particularly salami produced on Slovenian farms. Additionally, we will examine the potential inhibitory effect of starter cultures.

The study will address several Sustainable Development Goals (SDGs), which are also **part of the global goals set by the United Nations**: Goal 2 – Zero Hunger, Goal 3 – Good Health and Well-being, Goal 12 – Responsible Consumption and Production, and Goal 13 – Climate Action. By conducting this study, we will make a significant contribution to a more sustainable and resilient food supply chain.

Most of the research will take place in the laboratory, with a focus on mycotoxin analysis (LC-MS/MS). During employment, the candidate will also have the opportunity to visit and collaborate with international institutions. Given that the candidate will be employed at the Department of Meat Technology and Food Assessment, their work will also include sensory evaluation of meat and meat products, including pork.

Candidate responsibilities and employment conditions:

- fulfillment of PhD study obligations;
- **preferred experience and enthusiasm for laboratory work**, as well as basic knowledge of liquid chromatography;
- teamwork and collaboration within the research group;
- preference will be given to candidates with prior knowledge in the field of food science.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☒ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☒ **nagrade** *(awards (e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Univerza v Ljubljani, Biotehniška fakulteta University of Ljubljana, Biotechnical Faculty

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Denis Rusjan, denis.rusjan@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

4.03 Rastlinska produkcija in predelava

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.:
Rastlinska pridelava oziroma pridelava rastlinske hrane se sooča s kompleksnimi izzivi, ki jih povzročajo spreminjajoče se podnebne, ekonomske, naravovarstvene in družbene razmere. Edino sprejemljiva je trajnostna pridelava, ki ne zagotavlja samo okoljske, ampak tudi ekonomske in socialno-družbene stabilnosti, kar je nujno za nacionalno prehransko samooskrbo in družbeno neodvisnost. Na prehodu v zeleno, digitalno in podnebno nevtralno rastlinsko pridelavo, morajo pridelovalci hrane čim hitreje prilagoditi tehnologije pridelave, ki vključujejo digitalna orodja in obenem naravi sprejemljivejše ukrepe, s katerimi na kmetijskem gospodarstvu zagotavljajo ustrezno ekonomsko varnost. Družbeno zavedanje o okoljskih vprašanjih narašča, kar postavlja pritisk na pridelovalce hrane, da sprejmejo ukrepe, ki vključujejo zmanjšanje uporabe pesticidov in mineralnih gnojil in obenem uporabo obnovljivih virov energije, ohranjanje biotske raznovrstnosti ter skrb za ohranjanje zdravih kmetijskih ekosistemov. Z znanstvenega in strokovnega stališča vidimo velike možnosti v uporabi biostimulantov tudi v trajnih nasadih. Biostimulanti so raznolika skupina naravnih ali sintetičnih snovi, ki spodbujajo rast, razvoj, odpornost in kakovost rastlin. Njihova uporaba v vinogradništvu postaja vse bolj priljubljena, saj lahko prinašajo več prednosti, kot so povečana odpornost na stres, izboljšana kakovost pridelka in zmanjšana uporaba pesticidov. Biostimulante lahko uporabljajo v vinogradništvu za:
(i) spodbujanje koreninskega razvoja, saj pričakujemo povečano absorpcijo vode in hranil, kar rastlinam pomaga bolje prenesti sušo in druge stresne razmere;
(ii) povečanje tolerance na bolezni, škodljivce in abiotične stresne dejavnike, kot so ekstremne temperature, vročinski valovi, pomanjkanje vode itn.;
(iii) izboljšanje količine, kot tudi kakovosti grozdja in vina, tako na primernem kot tudi sekundarnem metabolizmu (topna suha snov, organske kisline, fenolne in aromatične spojine);
(iv) hitrejše okrevanje po sušnem, vročinskem ali vodnem stresu, saj številni biostimulanti pomagajo rastlinam hitreje okrevati in zmanjšati škodo;
(v) zmanjšanje uporabe pesticidov in gnojil, kar prispeva k zmanjšanju vpliva na okolje in nenazadnje
(vi) izboljšanje trajnosti, saj zmanjšajo potrebo po uporabi pesticidov, povečajo učinkovitost hranjenja in povečajo odpornost rastlin na ekstremne pogoje.
Pri uporabi biostimulantov je pomembno upoštevati pravilno doziranje in uporabiti izdelke, ki so primerni za specifične potrebe vinograda in okolja. Prav tako je pomembno slediti navodilom proizvajalca ter upoštevati lokalne zakonodajne zahteve in smernice za uporabo takšnih izdelkov.
Mlad(i/a) raziskoval(ec/ka) se bo najprej lotil(a) zasnove raziskovalnega načrta, ki bo omogočil sistematično in znanstveno analizo vpliva biostimulantov na rast in razvoj trte, ter na kakovost grozdja in vina. Ta načrt bo upošteval več dejavnikov, kot so izbira biostimulantov, metode aplikacije, časovni okvir študije in parametri za oceno rasti, razvoja ter kakovosti grozdja in vina, na nivoju primarnega in sekundarnega metabolizma. Mlad(a/i) raziskoval(ec/ka) bo moral(a) voditi natančne in dosledne zapise ter zagotoviti ustrezno ponovljivost eksperimentov, da bo lahko zanesljivo potrdil(a) ali ovrgel(a) hipoteze o vplivu biostimulantov na rast in razvoj trte ter na kakovost grozdja in vina. Končni cilj je prispevati k boljšemu razumevanju uporabe biostimulantov v vinogradništvu in njihovemu potencialu za izboljšanje trajnosti ter kakovosti pridelka in obenem k oblikovanju tehnoloških navodil za vinogradnike.
V okviru delovnega mesta bodo za opravljanje vseh potrebnih študij, poleg celotne raziskovalne opreme, na voljo tudi ustrezni infrastrukturni objekti, ki so na razpolago v okviru Hortikulturnega centra BF ter Ampelografskega vrta.
Od kandidat(a/ke) se pričakuje dobro poznavanje (i) tehnoloških praks in ukrepov v vinogradu in (ii) fizioloških in biokemijskih procesov ter (iii) metabolizmov v rastlin, kar kandidat(ka) dokazuje z opravljenimi ustreznimi izpiti na

BSc in MSc stopnji. Zaželene so izkušnje z delom v laboratoriju, sodelovanje pri raziskovalnem delu in dobro znanje angleškega jezika.

Eng.:
Plant food production is facing complex challenges caused by changing climate, economic, environmental, and social conditions. The only acceptable approach is sustainable production, which ensures not only environmental but also economic and socio-cultural stability, which is necessary for national food self-sufficiency and social independence. In transitioning to green, digital, and climate-neutral plant production, food producers must quickly adapt production technologies, including digital tools, and at the same time implement nature-friendly measures to ensure adequate economic security on agricultural farms. Social awareness of environmental issues is increasing, putting pressure on food producers to take measures that include reducing the use of pesticides and mineral fertilizers, as well as using renewable energy sources, preserving biodiversity, and ensuring the maintenance of healthy agricultural ecosystems. From a scientific and professional standpoint, we see great potential in the use of biostimulants in perennial plantations as well. Biostimulants are a diverse group of natural or synthetic substances that promote the growth, development, resistance, and quality of plants. Their use in viticulture is becoming increasingly popular as they can bring several advantages, such as increased stress resistance, improved crop quality, and reduced pesticide use. Biostimulants can be used in viticulture and grapevine nursery to:
(i) promote root development, as increased water and nutrient absorption is expected, which helps plants better withstand drought and other stressful conditions;
(ii) increase tolerance to diseases, pests, and abiotic stress factors such as extreme temperatures, heatwaves, water scarcity, etc.;
(iii) improve the quantity and quality of grapes and wine, both in primary and secondary metabolism (soluble solids, organic acids, phenolic and aromatic compounds);
(iv) facilitate faster recovery from drought, heat, or water stress, as many biostimulants help plants recover more quickly and reduce damage;
(v) reduce the use of pesticides and fertilizers, contributing to environmental impact reduction, and ultimately
(vi) enhance sustainability by reducing the need for pesticides, increasing feeding efficiency, and enhancing plant resilience to extreme conditions.
When using biostimulants, it is important to consider proper dosing and use products suitable for the specific needs of the vineyard and environment. It is also important to follow manufacturer's instructions and comply with local regulatory requirements and guidelines for the use of such products.
The young researcher will first embark on designing a research plan enabling systematic and scientific analysis of the impact of biostimulants on vine growth and development, as well as grape and wine quality. This plan will consider various factors such as biostimulant selection, application methods, study timeframe, and parameters for assessing vine growth, development, and grape and wine quality, at both primary and secondary metabolism levels. The young researcher will need to maintain accurate and consistent records and ensure experiment repeatability to reliably confirm or refute hypotheses regarding the influence of biostimulants on vine growth and development, as well as grape and wine quality. The ultimate goal is to contribute to a better understanding of biostimulant use in viticulture and their potential to enhance sustainability and crop quality and at the same time to introduction of technological instructions for grape producers.
For the complex research study, all necessary research equipment is available, as well as suitable infrastructure facilities within the Horticultural Centre of BF and the Ampelographic Garden.
Candidate is expected to have a good understanding of (i) technological practices and measures in the vineyard, (ii) physiological and biochemical processes, and of (iii) plant metabolism, demonstrated through relevant examinations at the BSc and MSc levels. Experiences in laboratory work and research activities, but also good knowledge of the English language are welcome and expected.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☒ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☒ **nagrade** *(awards (e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☐ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta (Biotechnical faculty)

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Simona Sušnik Bajec, simona.susnik@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

1.03 Biologija 1.03.01 Zoologija in zoofiziologija 4.02 Živalska produkcija in predelava 4.02.01 Genetika in selekcija 4.06 Biotehnologija

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Usposabljanje mlade raziskovalke/mladega raziskovalca (MR) bo potekalo v okviru programske skupine P4 0220, tematika doktorske naloge pa se bo navezovala tudi na aplikativni projekt L4-60175, katerega glavni namen je optimizacija prehrane plemenskih jat lipana (*Thymallus thymallus*) za izboljšanje reprodukcijskih in imunskih parametrov. Usposabljanje bo potekalo na Katedri za genetiko, animalno biotehnologijo in imunologijo Oddelka za zootehniko Biotehniške fakultete Univerze v Ljubljani. Program usposabljanja bo interdisciplinaren in bo obsegal področja reprodukcije, prehrane, genetike in imunologije. MR bo vključen v delo Lipan je ena najbolj ogroženih salmonidnih vrst rib, ki zahteva intenzivne varstvene ukrepe. Kljub zahtevnosti njegove vzreje specifična optimizirana krmna mešanica za plemenske jate ni bila razvita. Raziskava bo osredotočena na proučevanje vplivov novo razvite trajnostno naravnane krmne mešanice na reprodukcijske parametre, preživetje in prisotnost deformacij v zgodnjih fazah razvoja, ter imunski status plemenske jate in mladic. Doktorski projekt bo vključeval celostno ovrednotenje vpliva prehrane na ključne fiziološke procese, s poudarkom na reprodukciji in s ciljem izboljšanja vzreje te ekološko in gospodarsko pomembne vrste. Raziskovalno delo bo interdisciplinarno naravnano in bo vključevalo zbiranje vzorcev, splošne biološke pristope ter molekularne in biokemijske analize. Našo raziskovalno skupino odlikuje velik nabor različnih veščin, laboratorij je dobro in sodobno opremljen. Delo bo potekalo v tesnem sodelovanju z drugimi raziskovalnimi skupinami doma in v tujini. Program usposabljanja MR in natančna vsebina doktorske naloge, kot tudi izbira doktorskega študija bosta dokončno dogovorjena z izbrano/im kandidatko/om. Zaželene so izkušnje s terenskim delom in z delom v laboratoriju, z molekularno-biološkimi tehnikami ter poznavanje osnovnih statističnih orodij. Zaželen je magisterij na študijih s področja kmetijskih znanosti, naravovarstva, biologije, biotehnologije, veterine ali drugih sorodnih smeri. Od kandidatov pričakujemo visoko motiviranost in zanimanje za raziskovalno delo, dobre komunikacijske in timske veščine ter sposobnost samostojnega dela.

Eng.: Training of the Young Researcher (MR) will take place in the framework of research program P4-0220, while the doctoral research will also be linked to the applied project L4-60175, which aims to optimize the nutrition of grayling (*Thymallus thymallus*) breeding stock to enhance reproductive and immune parameters. Position is available at the Chair of Genetics, Animal Biotechnology and Immunology within the Department of Animal Science at the Biotechnical Faculty, University of Ljubljana. The training program will be interdisciplinary, covering the fields of reproduction, nutrition, genetics, and immunology. The MR will be integrated into the Grayling is one of the most endangered salmonid fish species, requiring intensive conservation measures. Despite the challenges in breeding, a species-specific optimized feed formulation for breeders has not yet been developed.

The research will focus on evaluating the effects of a newly developed sustainable feed formula on reproductive parameters, survival rates, and the presence of deformities in early developmental stages, as well as the immune status of both breeders and juvenile grayling. The doctoral project will comprehensively assess the impact of nutrition on key physiological processes, with a particular focus on reproduction, aiming to improve the breeding success of this ecologically and economically significant species.
The research will be interdisciplinary, involving sample collection, general biological approaches, molecular and biochemical analyses. Our research team brings together a broad range of expertise, and the laboratory is well-equipped with modern instrumentation. The work will be conducted in close collaboration with other research groups in Slovenia and internationally.

The specific training program and final content of the doctoral dissertation, as well as the selection of the doctoral study program, will be determined in agreement with the selected candidate.

Preferred qualifications of candidates include:

- Experience in filed and laboratory work, molecular biology techniques, and basic statistical tools.
- A Master's degree in agricultural sciences, environmental sciences, biology, biotechnology, veterinary medicine, or related fields.
- High motivation and interest in research, strong communication and teamwork skills, and the ability to work independently.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☐ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☒ **nagrade** *(awards (e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☐ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☐ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta (*Biotechnical faculty*)

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Marjetka Suhadolc, marjetka.suhadolc@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

Klasifikacija ARIS: 4.03 Biotehnika, Rastlinska produkcija in pridelava *Classification ARIS: 4.03 Biotechnical Sciences, Plant production)* Ključne besede: agroekologija, funkcionalna mikrobna ekologija tal, biotska odpornost tal proti patogenom *Key words: agroecology, functional soil microbial ecology, soil supressivness)*

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Kakovost tal je opredeljena kot sposobnost tal, da delujejo kot vitalni, živi sistem znotraj meja ekosistema in rabe zemljišč, pri čemer ohranjajo produktivnost rastlin in živali, kakovost vode in zraka ter podpirajo zdravje rastlin in živali. Z zagotavljanjem habitata koristnim mikroorganizmom lahko tla nadzorujejo širjenje škodljivih organizmov. Poleg neposrednega vpliva na patogene v rizosferi lahko talni mikrobiom vpliva tudi na mikrobiom rastline, saj mikroorganizmi v tleh usmerjajo naselitev specifičnih vrst endofitov, kar pripomore k večji odpornosti rastlin na stres, boljši absorpciji hranil ter zaščiti pred patogeni. Različne kmetijske prakse vplivajo na taksonomsko sestavo talnih mikrobnih združb, medtem ko je manj znanega o njihovem vplivu na njihovo funkcionalno sestavo. Namen doktorske naloge bo preučiti vpliv izbranih kmetijskih praks, kot sta večja pestrosti vegetacije in/ali dodajanje komposta, na sestavo talnega mikrobioma z vidika zdravja rastlin. Raziskava bo osredotočena na celostno oceno funkcionalnih genetskih virov, da bi zapolnili vrzeli v znanju med mikrobno pestrostjo in funkcijo ter prepoznali obogatene gene, povezane z različnimi kmetijskimi praksami. Metodologija bo vključevala izolacijo RNA in DNA ter identifikacijo funkcionalnih genov s qPCR in sekvenciranjem. Izkušnje z omenjenimi metodami so zaželene.

Eng.: Soil quality is defined as the ability of soil to function as a vital, living system within the boundaries of the ecosystem and land use, maintaining plant and animal productivity, water and air quality, and supporting plant and animal health. By providing habitat for beneficial microbes, soil can enhance soil suppressiveness against harmful organisms. In addition to their direct impact on pathogens in the rhizosphere, the soil microbiome may also affect the plant microbiome, as soil microorganisms can guide the colonization of specific endophyte species, which contributes to greater plant resistance to stress, improved nutrient absorption, and protection against pathogens. Different agricultural practices affect the taxonomic composition of soil microbial communities, while less is known about their impact on their functional composition. The aim of this doctoral thesis is to investigate the impact of selected agricultural practices, for example crop diversification and/or compost amendments, on the soil microbiome composition in relation to plant health. The research will focus on a holistic assessment of functional genetic resources to fill the knowledge gap between microbial diversity and function and to identify enriched genes associated with different agricultural practices. The methodology will include RNA and DNA isolation and functional gene identification using qPCR and sequencing. Experience with these methods is desirable.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☒ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☒ **nagrade** *(awards (e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Milan Šernek, milan.sernek@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

4.01.02 - Biotehnika/Gozdarstvo, lesarstvo in papirništvo/Lesarstvo

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Raziskovalno delo mladega raziskovalca/raziskovalke (MR) bo osredotočeno na pridobivanje novega znanja na dveh povezanih področjih: 1) razvoj novih bio-osnovanih lepil in optimizacija procesa lepljenja ter 2) izboljšanje adhezije in trdnosti lepilnih spojev pri zahtevnejšem lepljenju lesa listavcev in iglavcev. *Raziskava bo vključevala izdelavo novih bio-osnovanih lepil, optimizacijo procesa lepljenja lesa z novimi lepili ter celovito karakterizacijo utrjevanja lepilnih spojev iz fizikalnega in kemijskega vidika ter proučevanje dinamike rasti trdnosti lepilnega spoja. MR bo nova bio-osnovana lepila razvijal iz več potencialnih naravnih virov (lignin, tanin, šelak, …) in z uporabo različnih naravnih zamreževalcev in modifikatorjev. Na osnovi presejalnih testov bo izbral najbolj obetajoča bio-osnovana lepila, katerim bo proučil proces utrjevanja z diferencialno dinamično kalorimetrijo (DSC), dinamično mehansko analizo (DMA) in dielektrično analizo (DEA). Dinamiko rasti trdnosti lepilnega spoja bo proučeval s sistemom za avtomatizirano vrednotenje zlepljenosti (ABES). Končno validacijo kakovosti lepilnih spojev bo opravil po standardnih testih za lepila.* *Problem nezadostne adhezije in trdnosti spojev bo MR reševal z inovativnimi in okolju prijaznimi tehnologijami. MR bo v raziskavi sistematično ugotavljal in pojasnil vpliv plazemske in laserske predobdelave na kemijske, morfološke in adhezijske lastnosti površin lesa ter s tem na lepljenje smrekovine, bukovine, idr. in njihovih kombinacij (hibrid). MR bo proučil tako kemijske kot morfološke lastnosti površin z različnimi metodami (XPS, FT-IR, RTG microCT, SEM) ter strižno trdnost in delaminacijo lepilnih spojev. Ugotavljal bo vpliv obdelave površin lesa na omočitev in penetracijo lepila ter na doseženo adhezijo.* *Zaželeno je poznavanje področja lepil in lepljenja lesa ter osnovnih raziskovalnih metod za pripravo in testiranje lepilnih spojev.*

Eng.: The research work of the young researcher (MR) will focuses on acquiring new knowledge in two related areas: 1) development of new bio-based adhesives and optimization of the bonding process and 2) improvement of adhesion and strength of adhesive joints in demanding bonding of deciduous and coniferous wood species. *Research will include the production of new bio-based adhesives, the optimization of the bonding process of wood with new adhesives and the comprehensive characterization of the curing of the adhesive bonds from a physical and chemical point of view as well as the investigation of the dynamics of the growth of the strength of the adhesive bond. MR will develop new bio-based adhesives from different potential natural sources (lignin, tannin, shellac, ...) and using various natural crosslinkers and modifiers. Based on screening tests, the most promising bio-based adhesives will be selected, for which MR will study the curing process using differential scanning calorimetry (DSC), dynamic mechanical analysis (DMA) and dielectric analysis (DEA). The dynamics of the development of adhesive bond strength will be studied using the automated bonding evaluation system (ABES). The final validation of the quality of adhesive bonds will be carried out using standard adhesive tests.* *MR will try to solve the problem of insufficient adhesion and bond strength with innovative and environmentally friendly technologies. MR will systematically determine and explain the influence of plasma and laser pre-treatment on the chemical, morphological and adhesion properties of wood surfaces and thus on the bonding of spruce, beech, etc. and their combinations (hybrid). The chemical and morphological properties of the surfaces will be investigated using various methods (XPS, FT-IR, RTG microCT, SEM) as well as the shear strength and delamination of adhesive bonds. MR will determine the influence of the surface treatment of the wood on the wetting and penetration of the adhesive as well as on the adhesion achieved.* *Knowledge in the field of adhesives and wood bonding as well as the basic research methods for the preparation and testing of adhesive bonds is desirable.*

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☐ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☐ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☒ **nagrade** *(awards (e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **osnutek idejne zasnove raziskovalnega dela** *(preliminary research proposal)*

☐ **priporočilno pismo** *(letter of recommendation)*

☐ **druge priloge** *(other attachments)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Petra Terpinc; petra.terpinc@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

Rastlinska produkcija in predelava

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.:
Biološka dostopnost posameznih antioksidantov je zelo raznolika in nanjo močno vpliva tako obdelava živil kot interakcije antioksidantov z drugimi molekulami v matriksu živila. Raziskave v zvezi z biološko dostopnostjo antioksidantov so pomembne, ker so samo spojine, ki se sprostijo iz živilskega matriksa in absorbirajo v tankem črevesu, potencialno biološko razpoložljive in lahko kažejo svoje koristne učinke (tj. antioksidativne, antidiabetične, protirakave, protivnetne lastnosti).

Reševanje okoljskih vprašanj in odpravljanje prehranskih pomanjkljivosti zahteva prehod na prehrano pretežno rastlinskega izvora. Psevdožita so odličen vir beljakovin z visoko biološko vrednostjo in prehranskih vlaknin ter zagotavljajo ustrezne količine vitaminov, mineralov in fenolnih spojin. Vendar pa lahko visoka vsebnost vlaknin, odsotnost glutena, prisotnost antinutrientov in posebne senzorične lastnosti poslabšajo tehnološke in organoleptične značilnosti končnega izdelka.

Fermentacija je splošno priznana kot primerno orodje za izboljšanje tehnoloških lastnosti, hranilne vrednosti in senzoričnega profila ne-pšeničnih alternativ. Fermentirano psevdožitno moko lahko uporabimo za proizvodnjo novih, funkcionalnih prehranskih izdelkov. Poleg tega se lahko fermentirane psevdožitne sestavine uporabljajo tudi za obogatitev osnovnih živil.

Kratka vsebina naloge mladega raziskovalca: (1) proučiti vpliv fermentacije na kvalitativne in kvantitativne spremembe antioksidantov iz psevdožit, (2) oceniti biodostopnost fenolnih spojin psevdožit (3) ovrednotiti bioaktivne lastnosti fenolnih spojin, ki so bile podvržene fermentaciji (pred in po *in vitro* simulirani gastrointestinalni prebavi) ter (4) razviti funkcionalno živilo z atraktivno tehnološko, senzorično in prehransko kakovostjo.

Zahtevane so izkušnje z laboratorijskim delom, aktivno znanje slovenskega in angleškega jezika. Zaželeno je osnovno razumevanje statistike. Pričakuje se tudi samoiniciativnost in delavnost, smisel za timsko delo in zanimanje za znanstveno delo. Zaželen je magistrski študij živilstva, prehrane, biologije, biotehnologije, biokemije ali sorodnih področij.

Eng.:
The bioaccessibility of individual antioxidants varies widely and is greatly affected by food processing and the interactions of the antioxidants with other molecules in the food matrix. Research concerning the bioaccessibility of antioxidants is important because only compounds that are released from the food matrix and absorbed in the small intestine are potentially bioavailable and can exert their beneficial effects (i.e., antioxidant, antidiabetic, anticancer, anti-inflammatory properties).

Addressing environmental concerns and meeting nutritional deficiencies requires transition to a diet that is mainly plant-based. Pseudocereals are an excellent source of high biological value proteins and dietary fiber and provide relevant amounts of vitamins, minerals and phenolic compounds. However, the high fiber content, the absence of gluten, the presence of antinutrients and the peculiar sensory characteristics may deteriorate the technological and organoleptic characteristics of the final product.

Fermentation is widely recognized as a suitable tool to improve the technological properties, nutritional value and

sensory profile of non-wheat alternatives. The fermented pseudocereal flour can be used for the production of new, functional food products. In addition, fermented pseudocereal ingredients can also be used to fortify staple foods.

Brief content of the young researcher's project: (1) to study the impact of fermentation on qualitative and quantitative changes of antioxidants from pseudocereals, (2) to evaluate the bioaccessibilty of pseudocereal phenolic compounds (3) to assess bioactive properties of phenolic compounds that have undergone fermentation (before and after *in vitro* simulated gastrointestinal digestion), and (4) to develop of a functional food product with attractive technological, sensory and nutritional quality.

Experience with laboratory work, active knowledge of Slovenian and English language is required. A basic understanding of statistics is desirable. Self-initiative and hard work, a sense of teamwork and an interest in scientific work are also expected. A master's degree in food science and technology, nutrition, biology, biotechnology, biochemistry or related fields is preferred.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☐ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☐ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☐ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☐ **nagrade** *(awards (e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☐ **bibliografija** *(bibliography)*

☐ **življenjepis** *(CV)*

☐ **motivacijsko pismo** *(motivation letter)*

☐ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☐ **priporočilno pismo** *(letter of recommendation)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Stanislav Trdan, stanislav.trdan@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

4.03 Rastlinska produkcija in predelava (4.03.05 Fitomedicina)

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Usposabljanje MR bo potekalo na področju varstva rastlin na Katedri za fitomedicino, kmetijsko tehniko, poljedelstvo, pašništvo in travništvo (Odd. za agronomijo).

Zaradi čedalje višjih okoljskih standardov, sintetična fitofarmacevtska sredstva (FFS) v zadnjih desetletjih vse težje zadostijo kriterijem za registracijo, zato se zmanjšuje število registriranih FFS. To dejstvo še posebno velja za insekticide, ki so znani kot okolju in človeku najškodljivejša skupina FFS. Na navedeni katedri se od začetka 90-ih let ukvarjamo s preučevanjem, optimizacijo in implementacijo okoljsko sprejemljivih načinov zatiranja škodljivih organizmov, kamor uvrščamo na primer biotično varstvo rastlin, biotehniško varstvo rastlin, uporabo inertnih in rastlinskih prahov za zatiranje škodljivcev idr.

MR, ki se bo vpisal na doktorski študijski program Bioznanosti, se bo usposabljal na področju množičnega lovljenja rastlinskih škodljivcev, ki spada v zadnjem obdobju med najbolj aktualne okoljsko prijazne načine zatiranja te pomembne skupine škodljivih organizmov. Od kandidata/kandidatke, ki bo usposabljal/-a v okviru programske skupine Hortikultura in bo vključen/-a v aktualno raziskovalno in strokovno delo katedre na področju varstva rastlin (še posebno kmetijske entomologije in zoologije), pričakujemo samoiniciativnost, veselje do pridobivanja novih znanj, še posebno do raziskovalnega dela na področju kmetijstva (varstva rastlin) in komunikativnost, saj bo vključen/-a tudi v intenzivno mednarodno dejavnost katedre na področju okoljsko sprejemljivega zatiranja rastlinskih škodljivcev.

Eng.: The young researcher (YR) training will take place in the field of plant protection at the Chair of Phytomedicine, Agricultural Engineering, Field Crop Production, Pasture and Grassland Management (Dept. of Agronomy).

Due to increasingly higher environmental standards, synthetic plant protection products (PPP) have become increasingly difficult to meet the criteria for registration in recent decades, which is why the number of registered PPPs is decreasing. This fact is especially true for insecticides, which are known to be the most harmful group of PPPs to the environment and humans. Since the early 1990s, the aforementioned chair has been engaged in the study, optimization and implementation of environmentally acceptable methods of controlling harmful organisms, which include, for example, biological control, biotechnical plant protection, the use of inert and plant powders for pest control, etc.

YR, who will enroll in the doctoral study program in Biosciences, will be trained in the field of mass trapping of plant pests, which has recently become one of the most relevant environmentally friendly methods of controlling this important group of harmful organisms. From the candidate, who will train within the program Horticulture and will be involved in the current research and professional work of the chair in the field of plant protection (especially agricultural entomology and zoology), we expect self-initiative, joy in acquiring new knowledge, especially in research work in the field of agriculture (plant protection) and communication skills, as he/she will also be involved in the intensive international activity of the chair in the field of environmentally acceptable control of plant pests.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☐ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☐ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☐ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☐ **bibliografija** *(bibliography)*

☐ **življenjepis** *(CV)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta (Biotechnical Faculty)

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Valerija Zakšek, valerija.zaksek@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

LS8: Okoljska biologija, ekologija in evolucija LS8: Environmental Biology, Ecology and Evolution

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Iščemo radovednega in motiviranega kandidata, ki se bo pridružil raziskovalni skupini za speleobiologijo SubBioLab (https://www.subbio.net/). V ospredju raziskave mladega raziskovalca/-ke bo močeril ali človeška ribica, ena najbolj karizmatičnih podzemnih živali na svetu, ki ima hkrati tudi velik naravovarstveni pomen. Trenutne raziskave obsegajo raziskave njegovega genoma, kompleksne evolucijske zgodovine več evolucijskih linij, hibridizacije med njimi in varstveno genetske raziskave. Podrobnejši načrt raziskovalnega dela mladega raziskovalca/-ke in tema doktorske disertacije bo dogovorjena z izbranim kandidatom ali kandidatko. Mladi/-a raziskovalec/-ka bo vključen/-a v domače in mednarodne projekte v dinamičnem in raznolikem raziskovalnem okolju, imel/-a bo priložnost aktivne udeležbe na domačih in mednarodnih znanstvenih srečanjih in podporo pri objavljanju rezultatov v mednarodnih revijah. Obvezno je aktivno znanje angleškega jezika. Prednost bodo imeli kandidati z osnovnimi veščinami dela v molekularnem laboratoriju, osnovnim znanjem bioinformatike in/ali programskega okolja R, jamarskim izpitom.

We are looking for a highly motivated candidate to join the speleobiology research group, SubBioLab (https://www.subbio.net/). The focus of the young researcher's research will be the olm or proteus (*Proteus anguinus*), one of the most charismatic subterranean animals in the world, which also has a high conservation value. Current and ongoing research includes studies on its genome, its complex evolutionary history of multiple evolutionary lineages, hybridization between them and conservation genetics. The young researcher's detailed research plan and the topic of the doctoral thesis will be agreed with the successful candidate. The young researcher will be involved in national and international projects in a dynamic and diverse research environment, will have the opportunity to actively participate in national and international scientific meetings and will be supported in the publication of scientific results in international journals. Active knowledge of the English language is required. Preference will be given to applicants with basic experience in molecular laboratory, bioinformatics and/or programming in R environment. Experiences with caving is also an advantage.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)* ☒ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)* ☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☒ **nagrade** *(awards (e.g. Prešeren Prize of the University of Ljubljana, Prešeren Prize of a University of Ljubljana member and/or another equivalent award))*

☒ **bibliografija** *(bibliography)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Univerza v Ljubljani, Biotehniška fakulteta

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Igor Zelnik, igor.zelnik@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

Naravoslovje / Biologija

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Spremembe časovne in krajevne razporeditve ter količine padavin, so močno spremenile hidrološke razmere v mokriščih in drugih vodnih ekosistemih, s tem pa tudi razmere za uspevanje rastlinskih vrst in združb v mokriščih. Presihajoče Cerkniško jezero kot edinstven modelni sistem omogoča preučevanje vplivov teh sprememb vzdolž hidrološkega gradienta. Sestava in vitalnost mokriščne vegetacije je odvisna od sprememb različnih okoljskih gradientov, pa tudi režima upravljanja s temi površinami. Velika večina območja, na katerem se nahaja Cerkniško jezero, je v obdobju nizkega vodostaja vsaj občasno košena.

V okviru raziskovalnega dela mladega raziskovalca (MR), se bomo osredotočili na različne vrste mokriščnih rastlin in vegetacijske tipe, ki jih te gradijo (trstičja, združbe visokih šašev in čužke ter črnikastega in rjastega sitovca), in jih najdemo vzdolž hidrološkega gradienta na Cerkniškem jezeru. Cilj je opredeliti razlike med različnimi vegetacijskimi tipi, in sicer v vrstni sestavi, biomasi in rastiščnih razmerah. Podatki o biomasi kažejo tudi na to, kakšna je vitalnost posamezne vrste in sestojev v določenih rastiščnih razmerah in pod različnimi režimi upravljanja.

Pri terenskem delu v okviru projekta LIFE Tršca smo opazili, da obstajajo velike razlike v višini in gostoti sestojev posameznih rastlinskih združb kot tudi med ekotipi trsta (obrežnim, litoralnim, barjanskim tipom). En od ciljev bo raziskati, če se različni ekotipi trsta genetsko razlikujejo in s tem tudi različno odzivajo na rastiščne razmere in košnjo.

Zanimale nas bodo tudi povezave med dominantnimi rastlinskimi vrstami (njihovo vitalnostjo in elementno sestavo) in sestavo mikrobne združbe v njihovi rizosferi. Na sestavo mikrobne združbe v rizosferi ima pomemben vpliv vitalnost rastline, ki z izločanjem nekaterih snovi (asimilati, kisik) spreminja razmere. V zvezi s tem bomo preučili povezavo med tipom vegetacije, oziroma dominantno rastlinsko vrsto, njeno elementno sestavo in mikrobno združbo v rizosferi.

Različni sestoji trsta in drugi tipi močvirske vegetacije so lahko modelni sistemi za preučevanje predvidenih sprememb v hidroloških razmerah. Rezultati bodo pomembno prispevali k razumevanju vpliva okoljskih dejavnikov (vodostaja in lastnosti tal) in režima upravljanja na pestrost, vitalnost kot tudi na razporeditev preučevanih vegetacijskih tipov (rastlinskih združb, tipov trstičja). Ker želimo izsledke raziskav uporabiti tudi pri učinkovitem spremljanju stanja na večjih površinah, bomo iskali tudi možnosti v tej smeri. V ta namen želimo preveriti kako so razlike v koncentraciji barvil v listih dominantnih rastlinskih vrst povezane z razlikami v odbojnih spektrih sestojev. Ustrezna validacija daljinskega zaznavanja vegetacijskih tipov in razlikovanje med njimi bo povečalo učinkovitost spremljanja stanja sestojev na velikih površinah.

Aplikativni cilj in praktični doprinos raziskav bo tako ugotavljanje najprimernejših režimov upravljanja za izbrane vegetacijske tipe, z namenom doseči čim večjo vitalnost sestoja in vrstno pestrost.

Raziskovalno delo MR bo kombinacija terenskega in laboratorijskega dela. Od kandidata se pričakuje vozniški izpit B kategorije, ki je zaradi obsežnega terenskega dela tudi pogoj za zaposlitev. Zaželene so izkušnje z laboratorijskim delom, še posebej v laboratoriju za molekularne analize.
Zaradi obsežne količine podatkov, ki bodo pridobljeni v okviru raziskovalnega dela MR in naknadnih analiz podatkov, je zaželeno tudi poznavanje osnovnih metod v bioinformatiki.

Zaradi vpetosti raziskovalnega dela MR v mednarodni prostor, je pogoj za kandidate znanje angleščine – najmanj nivo B2.

Eng.: Changes in the temporal and local distribution and amount of precipitation have significantly changed the hydrological conditions in wetlands and other aquatic ecosystems and, thus, the conditions for the thriving of plant species and communities in wetlands. As a unique model system, the intermittent Cerknica Lake enables the study of the effects of these changes along the hydrological gradient. The composition and vitality of wetland vegetation depend on changes in various environmental gradients, as well as the management regime of these areas. The vast majority of the area on which Cerknica Lake is located is at least occasionally mowed during the low water level.

As part of the research work of the young researcher (MR), we will focus on the different types of wetland plants and the vegetation types that they build (reeds, stands of tall sedges, canary reed grass, and black and brown bog-rush), and they are found along the hydrological gradient on Cerknica Lake. The aim is to identify the differences between different vegetation types in species composition, biomass and site conditions. Biomass data also show the vitality of individual species and stands under specific habitat conditions and management regimes.

During the fieldwork within the LIFE Tršca project, we noticed big differences in the height and density of stands of individual plant communities and between reed ecotypes (riparian, littoral, marsh type). One of the objectives will be to investigate whether different reed ecotypes are genetically different and, thus, respond differently to habitat conditions and mowing.

We will also be interested in the relationships between dominant plant species (their vitality and elemental composition) and the composition of the microbial community in their rhizosphere. The composition of the microbial community in the rhizosphere is significantly influenced by the vitality of the plant, which, with the excretion of certain substances (assimilates, oxygen), changes the conditions. In this regard, we will examine the relationship between the type of vegetation, i.e. the dominant plant species, its elemental composition and the microbial community in the rhizosphere.

Different reed stands and other marsh vegetation types can be model systems for studying predicted changes in hydrological conditions. The results will make an important contribution to understanding the influence of environmental factors (water level and soil properties) and management regime on diversity and vitality, as well as on the distribution of the studied vegetation types (plant communities, reed types). Since we want to use the research results in effective monitoring of the status in larger areas, we will also look for options in this direction. For this purpose, we want to check how differences in the concentration of dominant plant species leaf pigments are related to differences in the reflective spectra of stands. Proper validation of remote sensing of vegetation types and differentiation between them will increase the efficiency of monitoring the condition of stands in large areas.

The applied goal and practical contribution of the research will be to determine the most appropriate management regimes for selected vegetation types in order to achieve the greatest possible vitality of the stand and species diversity.

Young researcher's work will be a combination of field and laboratory work. The candidate is expected to pass a category B driving test, which is also a condition for employment due to extensive fieldwork. Experience in laboratory work is desirable, especially in the laboratory for molecular analysis.
Due to the extensive amount of data that will be obtained in the framework of the Young researcher's work and subsequent data analysis, it is also desirable to know the basic methods in bioinformatics.
Due to the integration of the research work of the young researcher into the international arena, the condition for candidates is knowledge of English – at least level B2.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☒ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*

☒ **opis dosedanjega sodelovanja pri raziskovalnem delu** *(description of the candidate's research work)*

☒ **druge priloge** *(other attachments)*

Opis raziskovalnega dela *(Research work description*)

1. Članica UL (*UL member)*:

Biotehniška fakulteta / Biotechnical faculty

2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Jure Žigon, jure.zigon@bf.uni-lj.si

3. Raziskovalno področje (*Research field*):

Lesarstvo / Wood Science and Technology

4. Opis raziskovalnega dela (Research work description*)*:
Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce *(It includes any additional conditions that the candidate for a young researcher must meet, which are not listed in the call to tender for young researchers.)*.

Slov.: Les je naraven material z edinstvenimi strukturnimi, fizikalnimi in mehanskimi lastnostmi, ki določajo njegove možnosti uporabe v različnih aplikacijah. Na lastnosti lesa na makroskopskem nivoju v veliki meri vplivajo njegove inherentne strukturne lastnosti, prisotnost notranjih anomalij ter porazdeljevanje gostote in vlage. Nivo in variiranje lesne vlažnosti značilno vpliva tudi na njegovo dimenzijsko stabilnost, deformabilnost in trdnost, zato je razumevanje njenega vpliva bistveno za optimizacijo uporabe lesa v gradbeništvu, pohištveni industriji in drugih področjih. Navedene strukturne in fizikalne lastnosti lesa lahko preučujemo s porušnimi in neporušnimi metodami, med katere spada tudi preslikovanje lesnih sortimentov z rentgenskimi žarki in vizualizacija ter analiza preslikanih objektov z računalniško tomografijo (CT).

Usposabljanje mladega raziskovalca bo potekalo na Oddelku za lesarstvo, na Katedri za tehnologijo lesa. Raziskovalno delo bodočega mladega raziskovalca bo potekalo v okviru programske skupine P4-0430 »Gozdno-lesna veriga in podnebne spremembe: prehod v krožno biogospodarstvo«. Delo bo vključevalo preučevanje strukturnih, mehanskih in fizikalnih lastnosti lesa z uporabo porušnih in neporušnih tehnik. Poudarek bo na uporabi skeniranja z rentgenskimi žarki in analizi notranje zgradbe lesa, proučevanju porazdelitve gostote, anomalij (grče, razpoke in ostale napake) ter vlage v materialu. Skupaj z uporabo porušnih tehnik bo delo vključevalo karakterizacijo lastnosti lesenih elementov s področji gozdarstva, lesarstva in gradbeništva. Mladi raziskovalec bo predstavljal svoje ugotovitve na domačih in mednarodnih konferencah in v objavah v domačih in tujih znanstvenih revijah.

Kandidat za mladega raziskovalca mora imeti predhodno izobrazbo lesarske smeri. Od kandidata pričakujemo aktivno znanje slovenskega in angleškega jezika, zaželene so izkušnje za delo v laboratoriju, smisel za delo v skupini ter veselje do znanstveno-raziskovalnega dela. Naloge kandidata bodo poleg doktorskega študija zajemale tudi sodelovanje pri raziskovalnem delu, ki se povezuje s kandidatovo temo doktorske disertacije ter z raziskavami v okviru Katedre za tehnologijo lesa in programske skupine P4-0430.

Eng.: Wood is a natural material with unique structural, physical and mechanical properties that determine its potential for various applications. The properties of wood at the macroscopic level are largely influenced by its intrinsic structural characteristics, the presence of internal anomalies and the distribution of density and moisture. The level and variation of moisture content of wood also have a significant influence on the dimensional stability, deformability, stiffness and strength of wood, and knowledge of this influence is therefore essential for optimising the use of wood in construction, furniture manufacturing and other applications. These structural and physical properties of wood can be investigated using both destructive and non-destructive methods, including X-ray imaging of wood assortments and their visualisation by computed tomography (CT) analysis of the imaged objects.

The training of the young researcher will take place at the Department of Wood Science and Technology, within the Chair of Wood Science. The research work of the future young researcher will be conducted within the research program P4-0430 »Forest-Wood Chain and Climate Change: Transition to a Circular Bioeconomy«. The work will involve studying the structural, mechanical, and physical properties of wood using both destructive and non-destructive techniques. The focus will be on X-ray scanning and the analysis of the internal structure of wood, examining density distribution, anomalies (such as knots, cracks, and other defects), and moisture content. In combination with destructive techniques, the work will also include the characterization of the properties of wooden elements relevant to forestry, wood science, and construction sectors. The young researcher will present their findings at national and international conferences and publish in both domestic and international scientific journals. Candidates for the young researcher position must have a prior education in wood science and technology or a related field. They must have experience in laboratory work. The candidate is expected to have active knowledge

of both Slovenian and English, experience in laboratory work is desirable, as well as the ability to work in a team and enthusiasm for scientific research. In addition to doctoral studies, the applicant's duties will include participation in research work related to the applicant's dissertation topic as well as in research work within the framework of the Chair of Wood Technology and the research programme P4-0430.

5. Priloge, ki jih kandidat priloži k prijavi *(Documents that the candidate submits with the application)*:

☒ **diplomska listina/potrdilo o zaključku študijskega programa** *(diploma certificate for study programme, with which the candidate has enrolled/ will enroll in a doctoral degree programme)*

☒ **priloga k diplomi/ potrdilo o opravljenih obveznostih (***official transcript of all the grades for study programme, with which the candidate has enrolled/will enroll in a doctoral degree programme)*

☒ **potrdilo o do sedaj opravljenih obveznostih z ocenami študijskega programa, s katerim se bo kandidat prijavil na študij** *(official transcript of all the grades the candidate has received so far for the study programme, with which the candidate will enroll to a doctoral degree programme)*

☒ **življenjepis** *(CV)*

☒ **motivacijsko pismo** *(motivation letter)*