Kratek opis usposabljanja mladega raziskovalca (*Short description of the Young Researcher's training)*

1. Raziskovalna organizacija (*Research organisation)*:

Univerza v Ljubljani, Biotehniška fakulteta

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

Mateja Germ; e mail: mateja.germ@bf.uni-lj.si

3. Šifra in naziv raziskovalnega področja (*Research field*):

4 Biotehnika 4.03 Rastlinska produkcija in predelava

4. Kratek opis usposabljanja mladega raziskovalca (*Short description of the Young Researcher's training)*:

Navedite tudi morebitne druge zahteve, vezane na usposabljanje mladega raziskovalca (npr. znanje tujih jezikov, izkušnje z laboratorijskim delom, potrebne licence za usposabljanje…).

slo:

Izhodišče raziskave: Podnebne spremembe se odražajo v ekstremnih okoljskih razmerah, kot so dolga obdobja z jasnim vremenom in visoko ravnijo UV sevanja in sušami. Sedanje podnebne razmere negativno vplivajo na agroekosisteme, kar se odraža v slabši kakovosti in količini pridelka, ter slabši odpornost rastlin proti škodljivcem in boleznim. Vse našteto zmanjšuje varnost preskrbe s hrano. Silicij (Si) in selen (Se) sta koristna elementa za rastline, saj blažita negativne učinke različnih biotskih in abiotskih stresorjev, vključno s sušo, UV sevanjem in patogeni. Kljub visokim ravnem Si v tleh bo za uspešno gojenje poljščin v prihodnosti potrebno dodajanje Si, saj zaradi nenehnega odnašanja pridelka prihaja do zmanjšanja količine rastlinam dostopnega Si. Slovenija je dežela z nizko vsebnostjo Se v tleh. Dodajanje Si in Se je tako obetaven ukrep za povečanje fitnesa kmetijskih rastlin. Preučevanje učinka gnojenja s Si in Se pri izbranih poljščinah, v razmerah pomanjkanja vode v kombinaciji z naravnim UV-sevanjem in močno zmanjšanim UV sevanjem, bo razkrilo medsebojne vplive med temi parametri, omilitvene učinke Si in Se in njuno biokemično delovanje ter mehanizme tolerance, pogojene z dodajanjem Si in Se poljščinam. Poleg tega bodo rezultati pokazali učinkovitost dodajanja obeh elementov glede na čas dodajanja ter potrebe po spremljanju rastlinam dostopnega Si in Se v tleh. **Delovna hipoteza MR:** Dodajanje Si in Se gojenim rastlinam bo izboljšalo njihov fitnes v razmerah pomanjkanja vode in naravnega/zmanjšanega UV sevanja. Učinek se bo odražal na fiziološki, morfološki in biokemijski ravni. Dodajanje Si in Se spodbuja sintezo antioksidantov in fenolnih snovi v poljščinah, kar povečuje njihovo zmožnost za premagovanje stresa. Zato je uporaba teh elementov koristna tehnika za izboljšanje odpornosti gojenih rastlin na omejitve okolja in njihove prehranske vrednosti, tako zaradi tvorbe antioksidantov kot tudi biofortifikacije. **Metode dela:** Raziskovane modelne rastline bodo obravnavane s Si in Se in izpostavljene različnim ravnem UV sevanja ter pomanjkanju vode. Analizirali bomo koncentracijo Si in Se, fotosinteznih barvil ter fenolnih snovi v gojenih rastlinah. Ionomske študije bodo razkrile porazdelitev Si in Se in drugih elementov v rastlinah, predvsem v semenih oz. plodovih. To vedenje ni pomembno le z vidika delovanja rastlin, ampak tudi z vidika kakovosti užitnih delov pridelka in njihove hranilne vrednosti, saj Si in Se

lahko vplivata na privzem in spremenita porazdelitev nekaterih pomembnih elementov v rastlinah.
Izvirnost rezultatov in njihov potencialni vpliv: Rezultati predlagane raziskave bodo osnova za nove biotehnološke in agronomske prakse, katerih cilj je izboljšati odpornost poljščin in trajnost njihove pridelave ter zagotoviti pridelke z visoko prehransko vrednostjo.
Potrebna znanja: Prednost imajo kandidati z izkušnjami pri terenskem in laboratorijskem delu z rastlinami ter z znanjem slovenskega in angleškega jezika.

eng:

Scientific background: Climate changes imply fluctuating and extreme environmental conditions, such as long periods with clear sky and high UV levels and severe droughts. Present climate conditions negatively affect agroecosystems, reducing crop yield and quality, resistance to pests and diseases, which consequently decreases food security. Silicon (Si) and selenium (se) are beneficial elements for plants, since they mitigate negative effects of different biotic and abiotic stressors, including drought, UV radiation and pathogens. In spite of the high Si levels in soils, crops will require Si application in the future to maintain maximum yields, as continuous crop harvesting has resulted in depleted soil pools of plant available Si. Slovenia is a country with low amount of Se in the soil. The addition of Si and Se is thus a promising measure to increase plant fitness. Studying the effect of Si and Se fertilisation in selected crops, exposed to water shortage in combination with solar UV radiation and reduced UV radiation, will reveal interactions between these parameters, the ameliorative effects of Si and Se and their biochemical function, and the mechanisms of Si- and Se-mediated tolerance in crops. In addition, it will bring better insight to the effectiveness of Si and Se addition in terms of application time and needs for monitoring of plant available Si and Se. **Hypothesis:** The addition of Si and Se to crops will improve their fitness in the conditions of water shortage and solar/reduced UV radiation. The effect will be reflected at the physiological, morphological and biochemical level. The addition of Si and Se stimulates the synthesis of antioxidants and phenolic substances in crops, which increases their ability to overcome stress. Therefore, the use of these elements is a useful technique for improving the resistance of crops to environmental constraints and their nutritional value, both due to the formation of antioxidants and biofortification. **Methods:** The investigated model plants will be treated with Si and Se and exposed to different levels of UV radiation and water deficiency. The concentration of Si and Se, photosynthetic pigments and phenolic substances in crops will be analyzed. Ionomic studies will reveal the distribution of Si and Se and other elements in plants, especially in seeds/fruits. This is not only important for plant functioning, but also for quality of edible crop parts and their nutritional value, since Si and Se may increase the uptake of nutrients and alter the distribution of some important elements in plants. **Originality of results and their potential impact**: The outcomes of the proposed study will provide the basis for new biotechnological and agronomical applications aiming to improve crop resilience and the sustainability of crop production and to ensure products with high nutritional value.
Required knowledge: Preference is given to candidates with experience in field and laboratory work with plants and with knowledge of Slovene and English.