



Kmetijski inštitut Slovenije

ODZIV NAVADNEGA FIŽOLA NA SUŠNI STRES NA NIVOJU PROTEINOV

Differential proteomic analysis of drought stress response in
leaves of common bean (*Phaseolus vulgaris* L.)

Zadražnik T., Hollung K., Egge-Jacobsen W.,
Meglič V., Šuštar-Vozlič J.

Vir: J Proteomics, 2013, 78: 254-272, doi: 10.1016/j.jprot.2012.09.021.

Različne oblike stresa

- **Biotski stres**

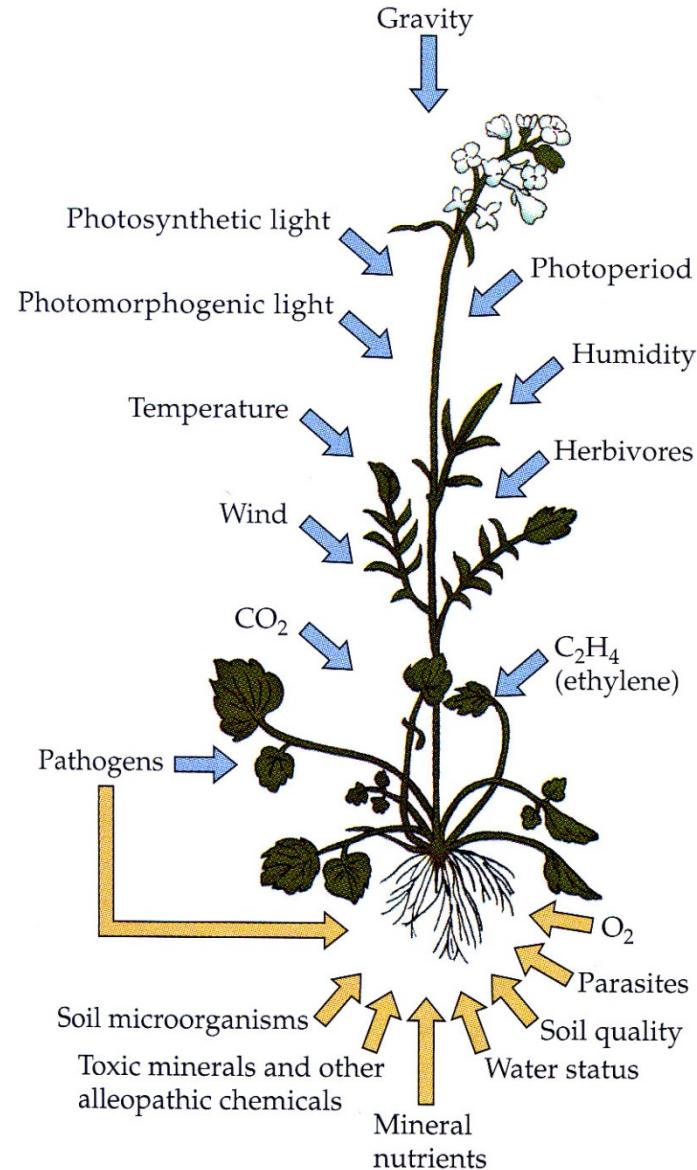
- bolezni (glove, bakterije, virusi),
- škodljivci,
- pleveli,....

- **Abiotski stres**

- suša,
- poplave,
- slanost,
- mraz, vročina,
- UV sevanje, oksidativni stres,...

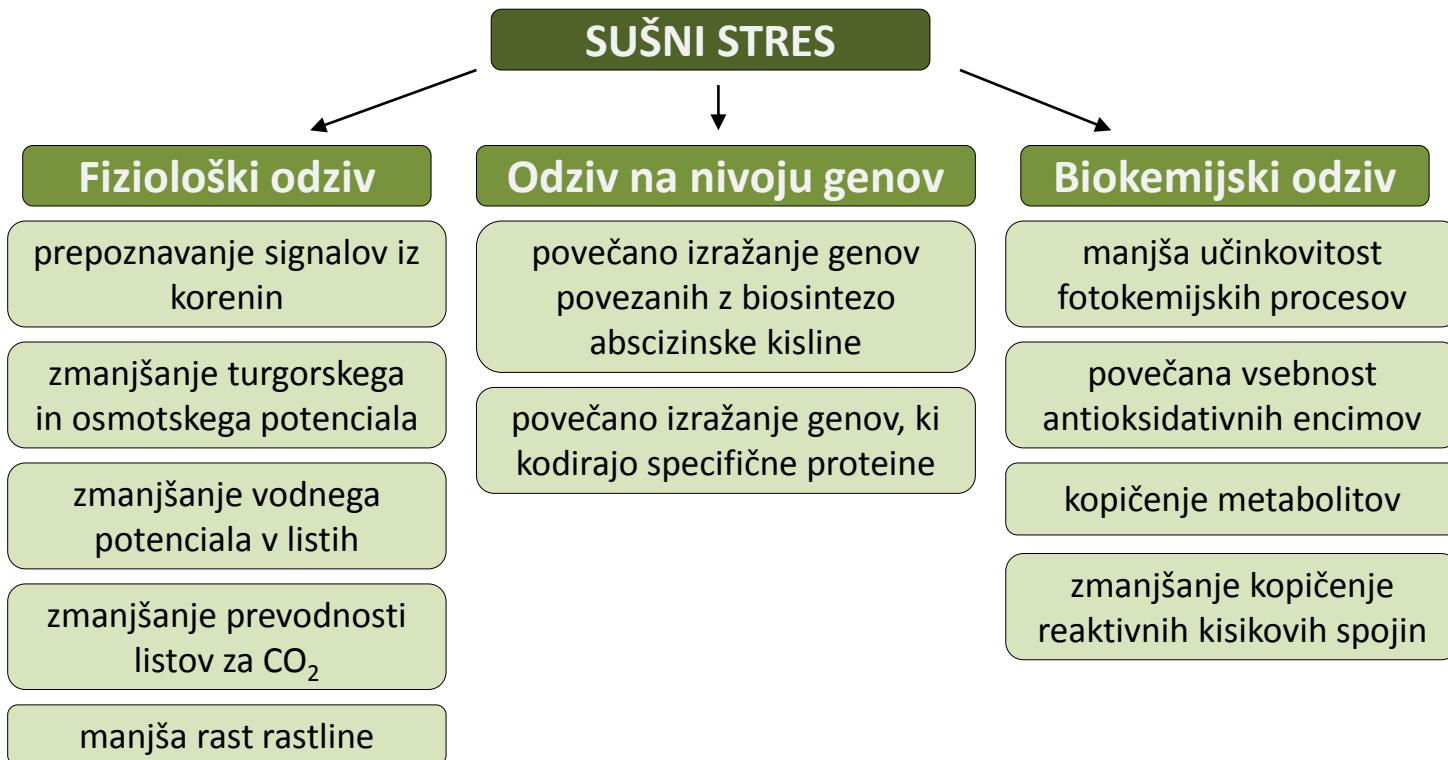
- **Antropogeni stres**

- herbicidi,
- težke kovine,
- onesnaženje zraka, kisli dež,..

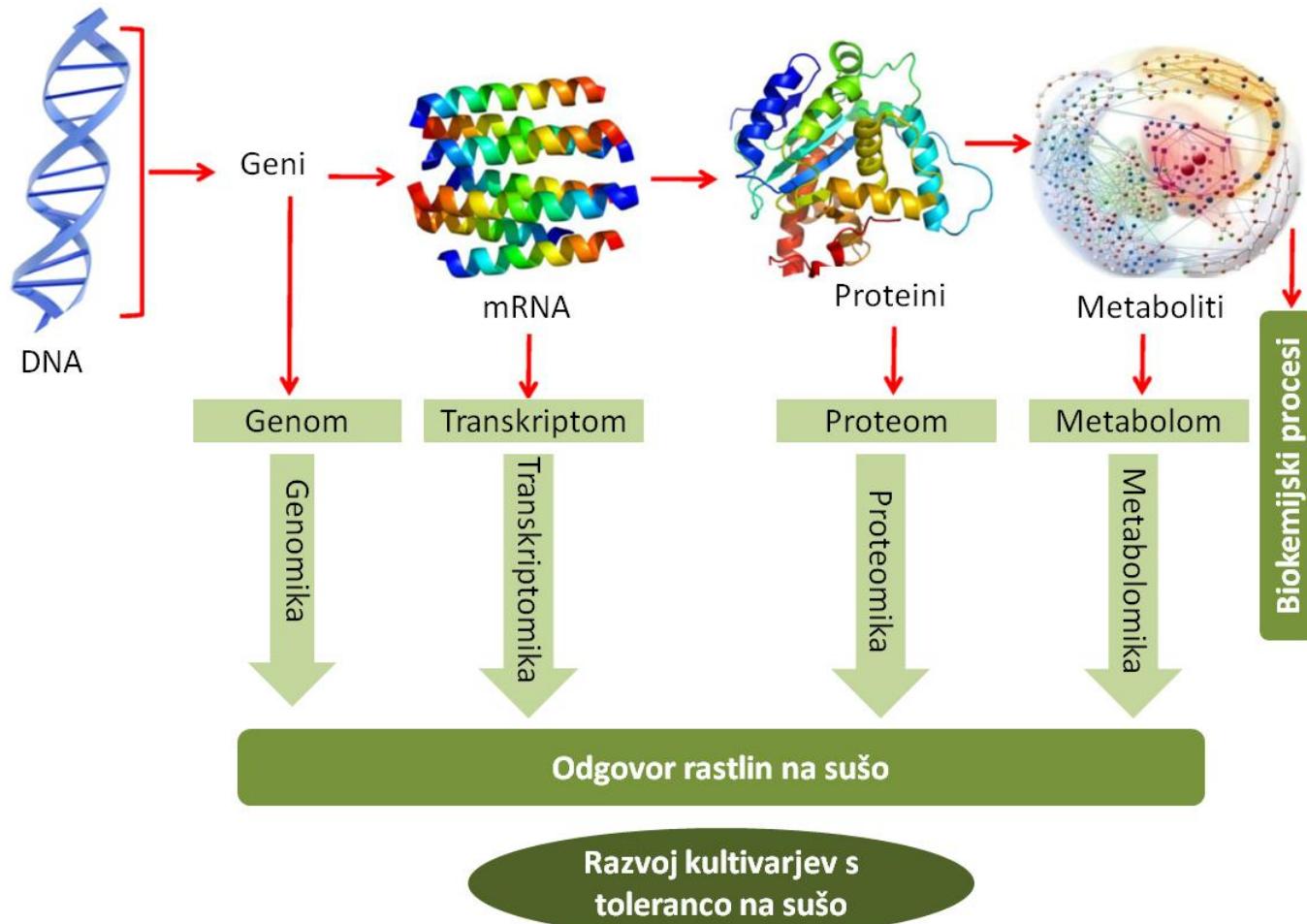


Suša in rastline

- Suša vpliva na rast in razvoj rastlin ter na količino in kakovost pridelka.
- Splošni odziv na sušne razmere vključuje fiziološke in molekularne procese:



Suša in rastline



Navadni fižol (*Phaseolus vulgaris* L.)

Občutljiv na sušo, v svetovnem merilu kar 60 % fižola pridelajo v pogojih pomanjkljive oskrbe z vodo.

Vpliv suše na rastline fižola:

- odpadanje cvetov, mladih strokov in zrnja,
- zmanjšanje biomase, števila strokov in pridelka,
- zmanjšanje vnosa P in N v rastlino,
- zmanjšanje mase korenin,...



Mehanizem tolerance na sušo še ni dovolj proučen zaradi genetske kompleksnosti in zapletenega mehanizma tolerance

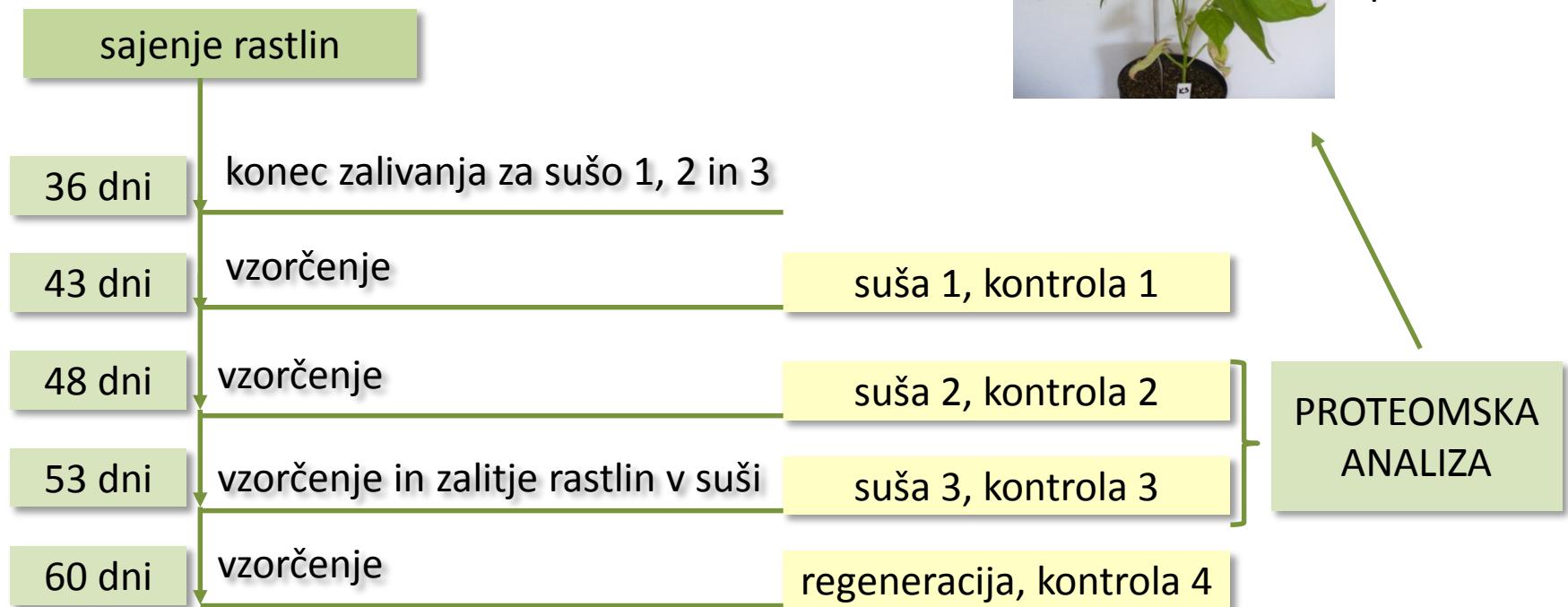
Potek poskusa

Namen:

identifikacija proteinov s spremenjenimi vsebnostmi
v suši za kultivar **Tiber** in **Starozagorski čern**



vzorčenje
3. lista za
analizo
celokupnih
proteinov

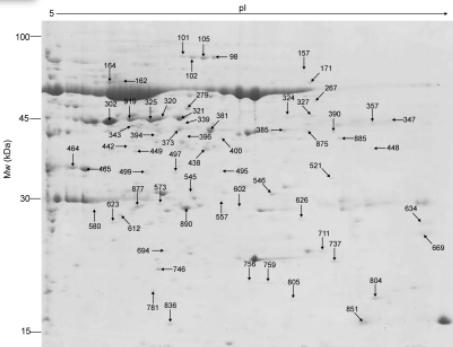
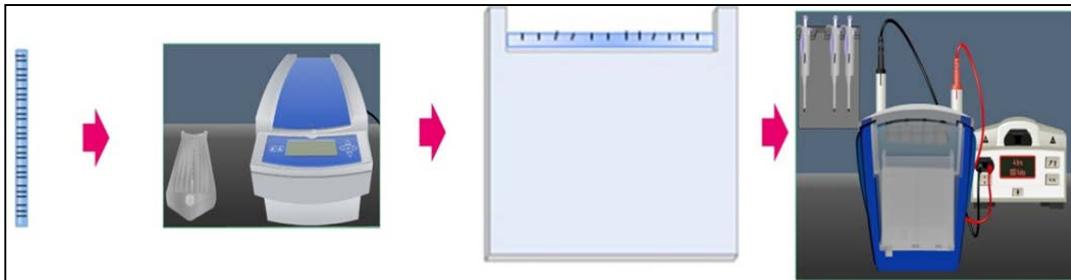


Potek poskusa

eksperimentalni
načrt

izolacija
proteinov

ločitev na 2D gelski
elektroforezi



slikanje gelov in
analiza slik

identifikacija proteinov in
bioinformatska obdelava



izolacija proteinskih lis z
različno vsebnostjo v suši

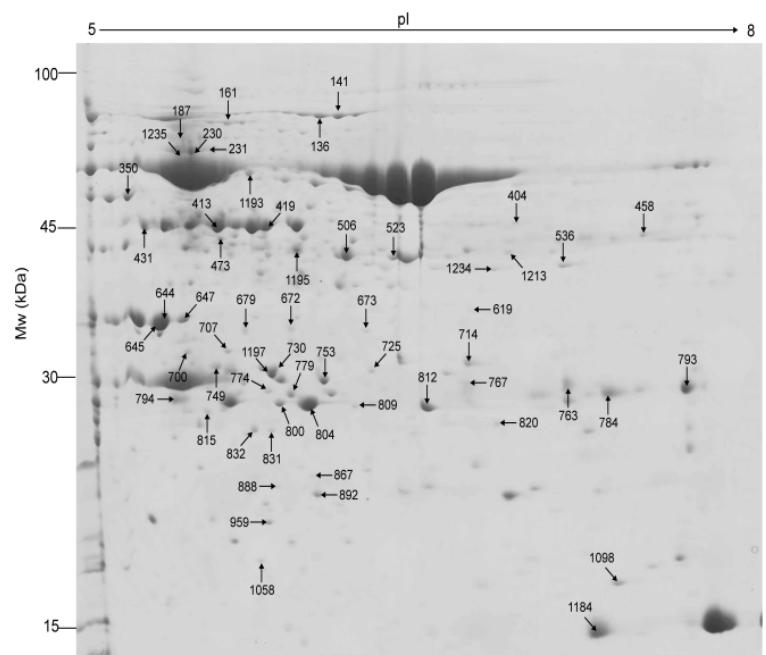
Rezultati

➤ Starozagorski čern:

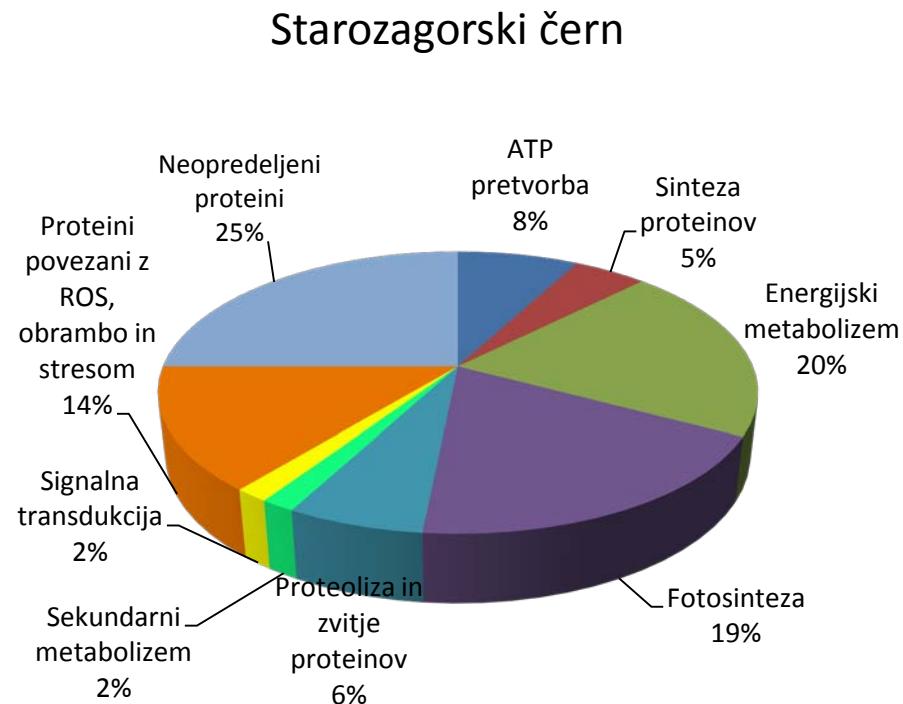
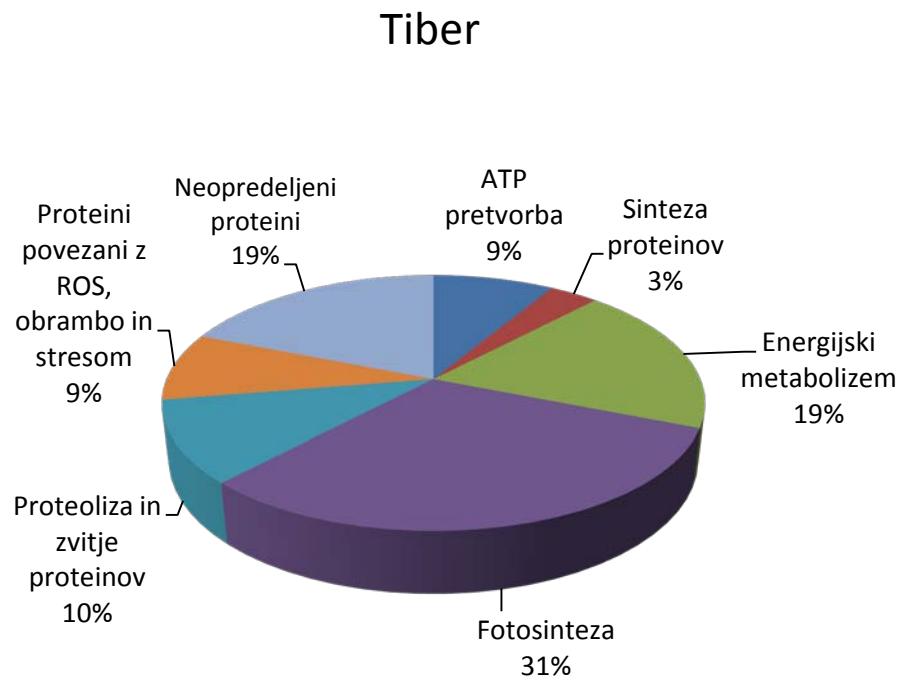
- skupno določenih 543 proteinskih lis
- 68 proteinskih lis s spremenjenimi vsebnostmi v stresnih pogojih
- 64 proteinov uspešno identificiranih (32 ↑, 32 ↓)

➤ Tiber:

- skupno določenih 400 proteinskih lis
- 62 proteinskih lis s spremenjenimi vsebnostmi v stresnih pogojih
- 58 proteinov uspešno identificiranih (39 ↑, 19 ↓)



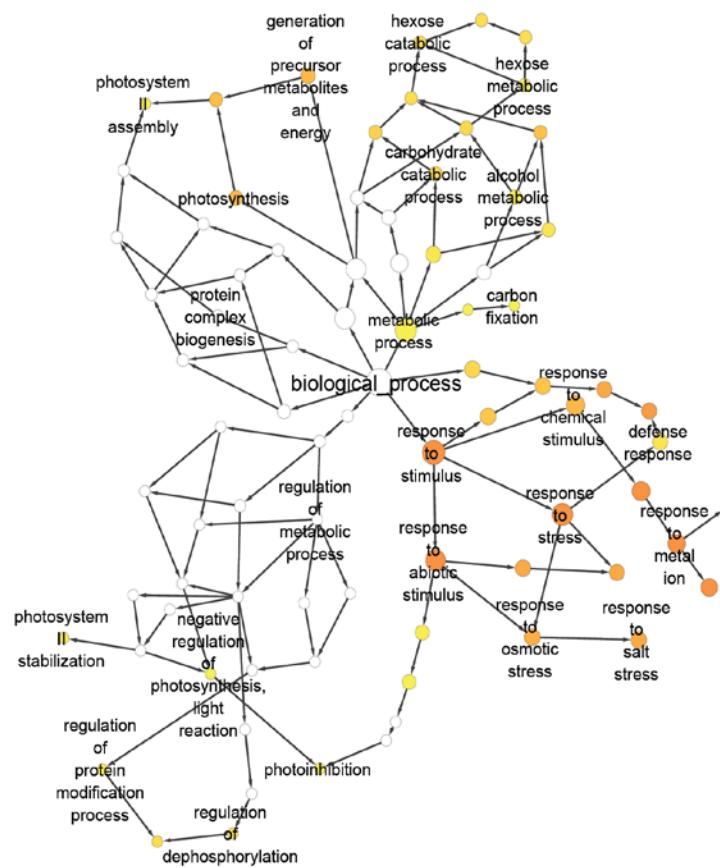
Rezultati



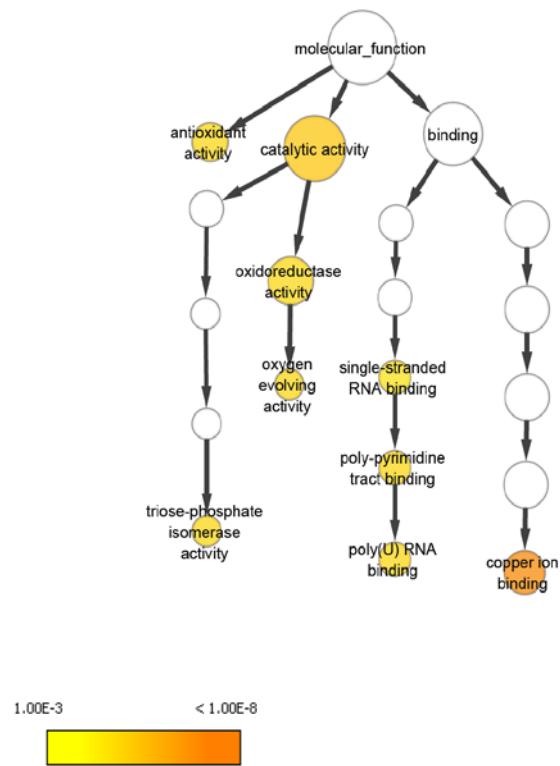
Razvrstitev identificiranih proteinov v skupine glede na njihove biološke funkcije

Bioinformatska analiza

Mreža bioloških poti



Mreža molekulskeih funkcij



Zaključek

- Suša vpliva na vsebnost proteinov, ki so povezani z **energijskim metabolizmom, fotosintezo, obrambo proti stresu, ATP pretvorbo ter proteine povezane s sintezo, zvijanjem in proteolizo**;
- suša ima večji vpliv na zmanjšanje vsebnosti proteinov udeleženih pri fotosintezi pri Starozagorskem, kot pri Tibru (posebno zanimivi so **proteini vključeni v oksidacijo vode**);
- določene proteine lahko uporabimo kot **markerje pri selekcijskem procesu tolerance na sušo pri navadnem fižolu**

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Differential proteomic analysis of drought stress response in leaves of common bean (*Phaseolus vulgaris* L.)

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ABSTRACT

The majority of common bean plants are cultivated under drought conditions. Maintaining crop yields under drought stress is thus one of the biggest challenges facing bean production. In order to improve our understanding of the complex mechanisms involved in the response of common bean (*Phaseolus vulgaris*) to drought stress, a proteomic approach was used to identify drought responsive proteins in leaves of two cultivars growing in these two different environments. A total of 1371 protein spots were detected by 2D PAGE and used to compare differences in protein abundance between control and stressed plants. Fifty-eight proteins whose abundance changed significantly were identified by LC-MS/MS in Tibor and 66 in Starozagorski bean. The majority of identified proteins were grouped into functional categories: energy metabolism, photosynthesis, ATP biosynthesis, protein synthesis and proteolysis, stress and defense related proteins. Details of the function of the identified proteins and their abundance profiles in Tibor and Starozagorski are discussed. Interestingly, some proteins were detected only in one of the two cultivars, suggesting a cultivar specific response to drought stress. The results form the basis for a further understanding of the biochemical mechanisms of drought response in common bean.

1. Introduction

Drought stress is one of the main abiotic stresses limiting developing drought resistant lines, consequently contributing to high productivity of this important food legume [2]. The complex drought stress response in plants comprises

Zahvala

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- University of Oslo,
Department of Molecular Biosciences



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iz EGP in Norveškega finančnega mehanizma



Hvala za pozornost!