



Changes in proteome profiling of potato roots upon soil drought

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Introduction: Drought is one of the major abiotic stresses affecting plant growth, development and productivity. Potato (*Solanum tuberosum* L.) have relatively shallow root systems and is moderately drought sensitive crop (Schafleitner et al., 2007) whose yield is drastically restricted by dehydration. Recent evidence indicates that the reprogramming of gene expression results in the reorganization of plant metabolism under unfavourable environmental conditions. Since variations in drought resistance have been observed among different potato cultivars in the present experiments the up- and down-regulated root proteins in drought resistant cultivar Gwiazda drought-sensitive cultivar were Oberon assayed in order to establish the molecular markers of the drought

Material and methods: Potato plants, three weeks after initiation of tuberisation, were subjected to soil drought by water shortage for 14 days. Proteins were extracted from potato roots according to standard protocol using TCA extraction method. Samples equal to 30 µg proteins were applied to each gel. Proteins were separated in the first dimension using the isoelectric focusing (IEF) tube gels and in the second dimension using SDS-PAGE. IEF tube gels 7 cm long with pH ranging from 3 to 7 were used. Electrophoresis was carried out at 250 V for 20 min. SDS-PAGE was performed using 12% polyacrylamide gels with 4% stacking gels at 25 mA. Finally, the gels were stained over night with Coomassie blue. Gels were scanned using ImageScanner III GE Healthcare. Protein markers were analyzed using Delta2D software 4.4.

Results:

Gwiazda drought resistant

Oberon drought susceptible

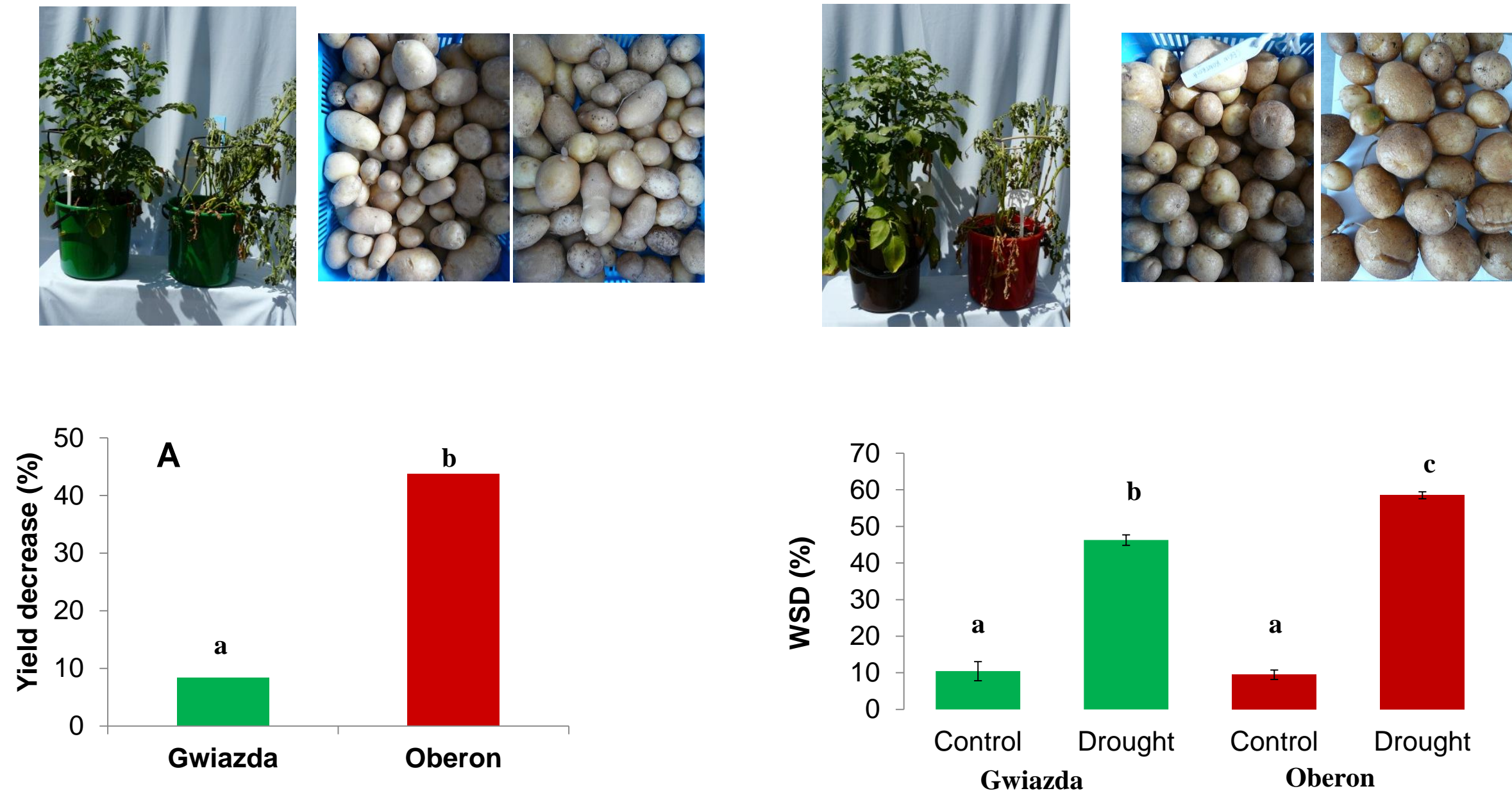
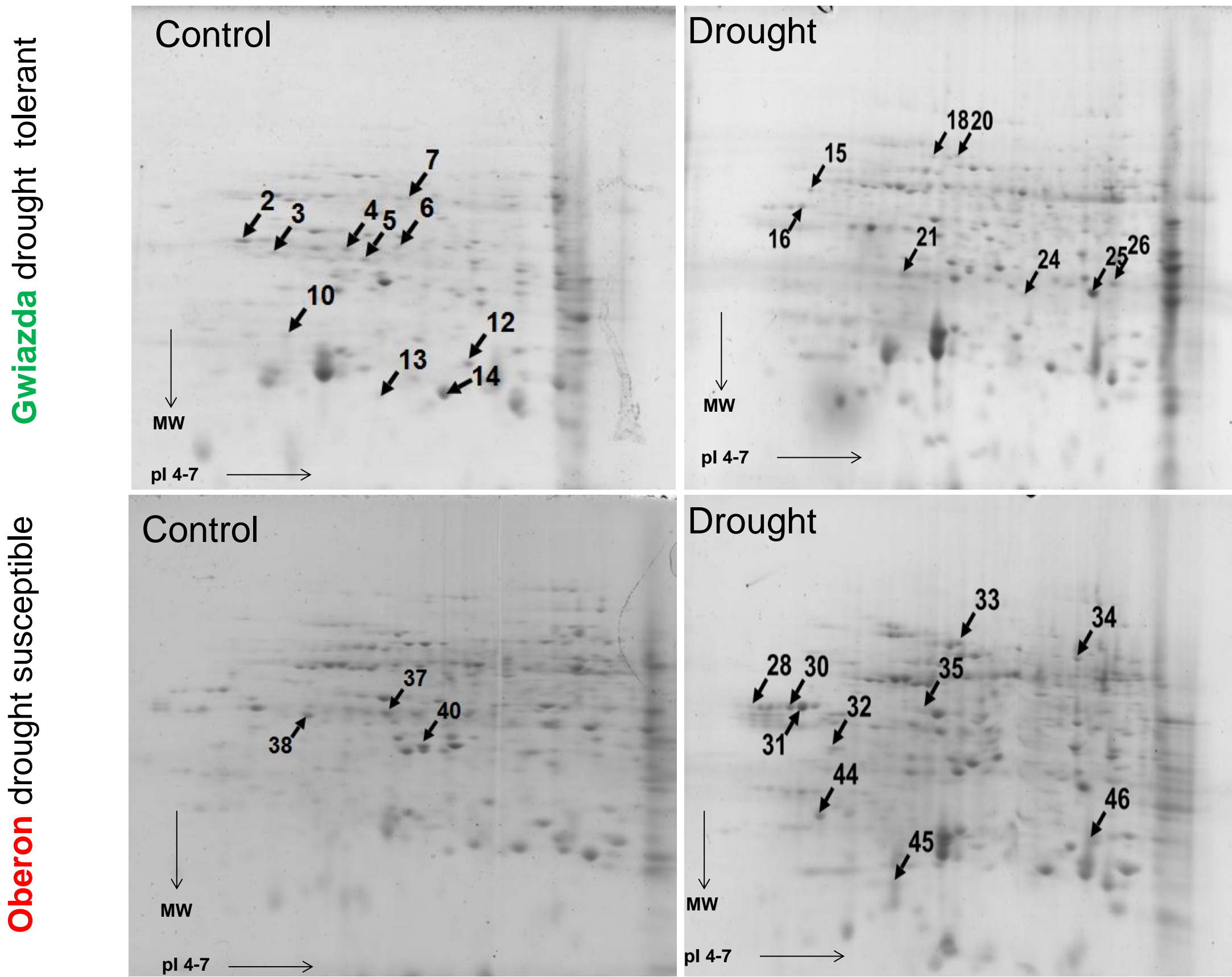
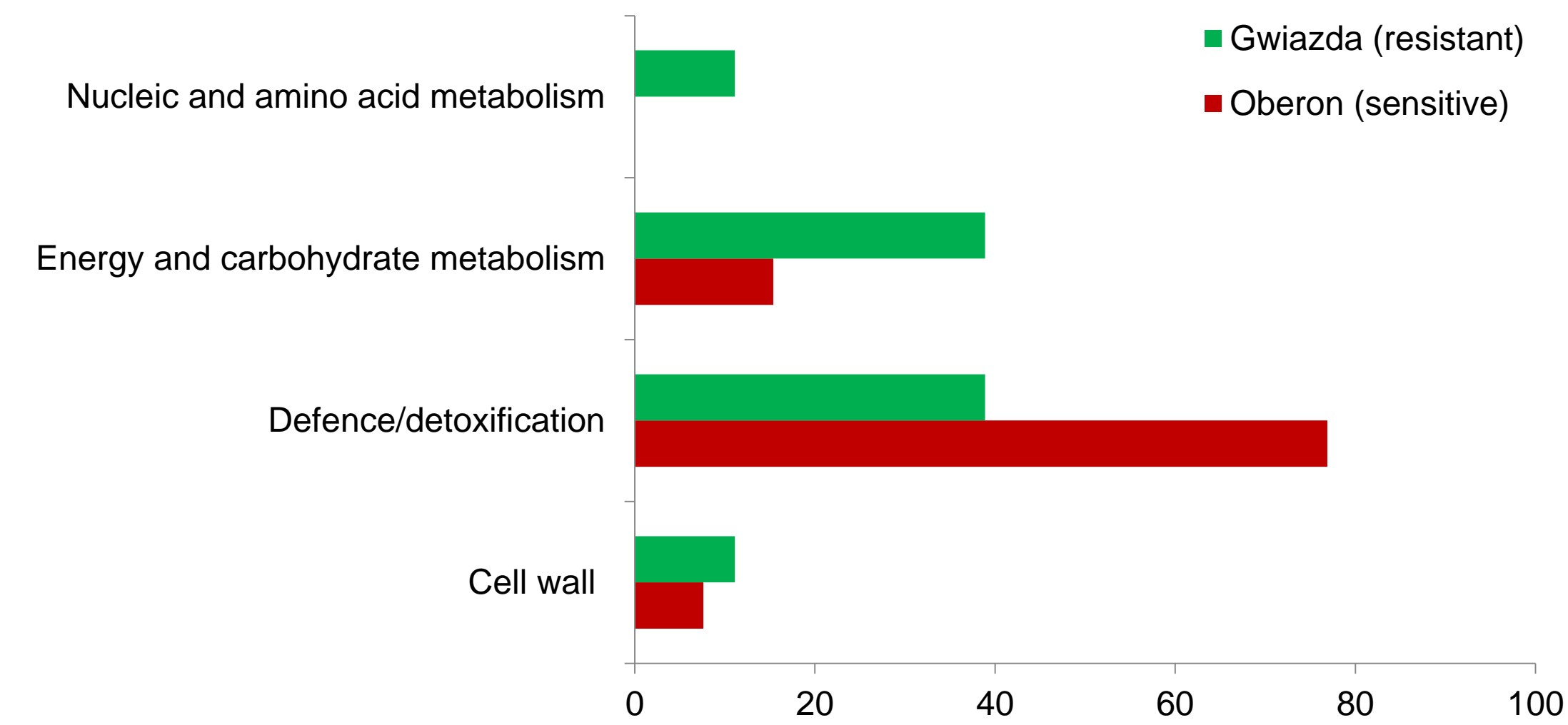


Fig.1. Potato tuber yield decrease (%) and relative water content in leaves under soil drought condition.



Ryc. 2. Gels of potato roots subjected to drought of Gwiazda and Oberon cultivar



Ryc. 3. Functional distribution of identified proteins expressed in potato shoots under drought stress

References:

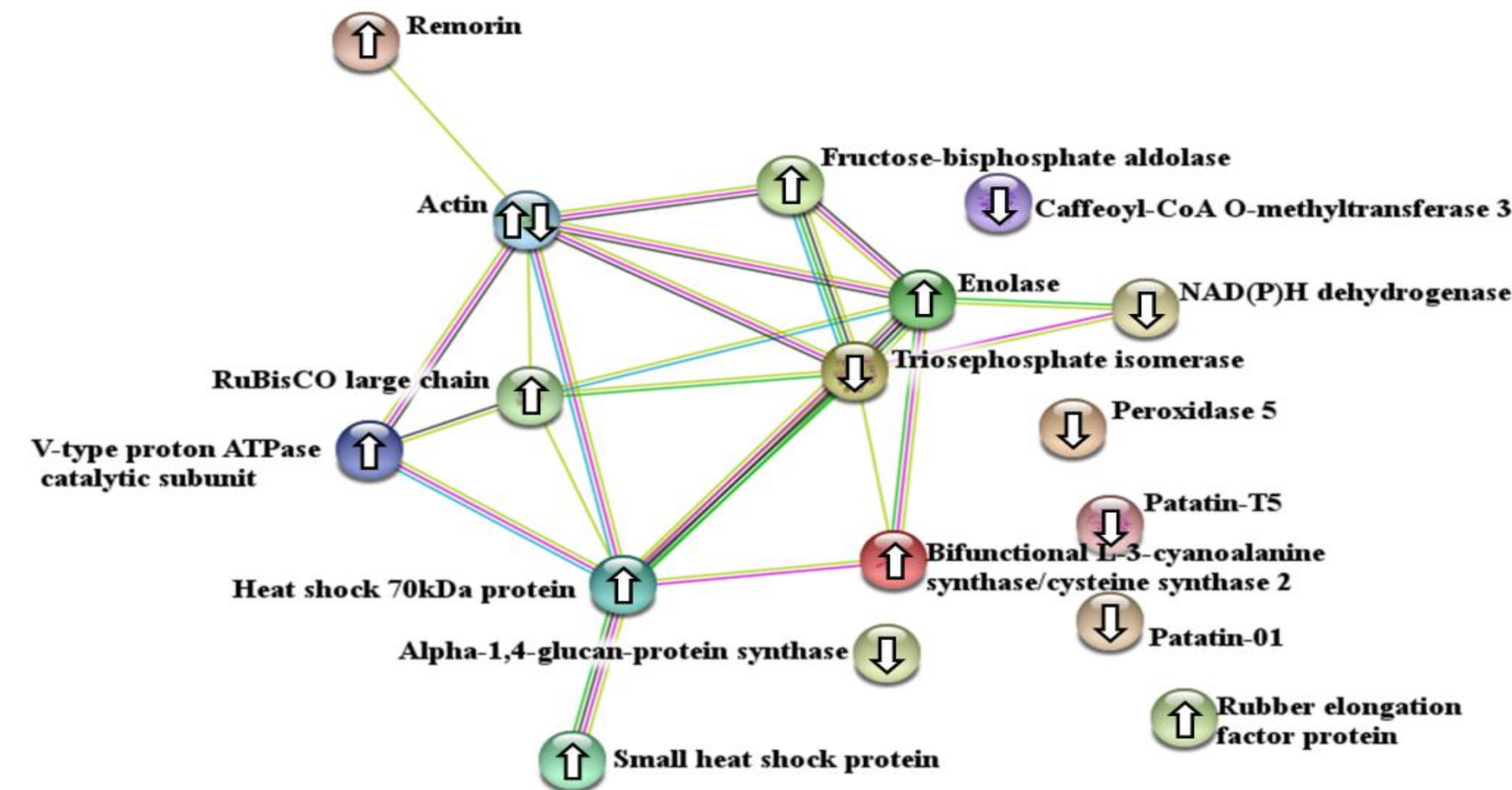
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Tab.1. Potato roots proteins identified from drought tolerant cultivar Gwiazda

No	Reg	Protein	Accession	Score	Cover	Matches	Mass	Plant
Nucleic and amino acid metabolism								
26	↑	Bifunctional L-3-cyanoalanine synthase/cysteine synthase 2, mitochondrial	Q9FS29	1236	34	25	37668	Solanum tuberosum
Energy and carbohydrate metabolism								
7	↑	Enolase OS	P26300	3532	43	58	48054	Solanum lycopersicum
12	↓	Triosephosphate isomerase, cytosolic	P48495	2340	19	43	27343	Petunia hybrida
14	↓	NAD(P)H dehydrogenase (quinone)	Q9LSQ5	894	23	13	21782	Arabidopsis thaliana
18	↑	V-type proton ATPase catalytic subunit	P09469	4958	47	80	69077	Daucus carota
21	↑	Fructose-bisphosphate aldolase	Q40677	271	15	5	42208	Oryza sativa subsp. japonica
24	↑	Ribulose bisphosphate carboxylase large chain	P05698	818	28	20	53672	Hordeum vulgare
Defence/detoxification								
2	↓	Patatin-T5	P15478	2709	40	51	42368	Solanum tuberosum
3	↓	Patatin-01	Q2MY50	2930	32	51	42638	Solanum tuberosum
6	↓	Peroxidase 5	A7QEU4	245	13	5	36016	Vitis vinifera
13	↑	Small heat shock protein, chloroplastic	Q95661	2268	48	59	26267	Solanum lycopersicum
15	↑	Rubber elongation factor protein	P15252	400	39	10	14713	Arabidopsis thaliana
20	↑	Heat shock 70 kDa protein	Q08276	3653	31	57	73317	Solanum tuberosum
25	↑	Remorin OS	P93788	3033	69	98	21756	Solanum tuberosum
Cell wall								
10	↓	Caffeoyl-CoA O-methyltransferase 3	O24150	337	21	8	27334	Nicotiana tabacum
5	↓	Actin OS	P20904	637	15	12	42017	Volvox carteri
16	↑	Actin OS	O65316	369	14	6	41791	Mesostigma viride
4	↓	Alpha-1,4-glucan-protein synthase [UDP-forming]	Q8RU27	696	25	15	42146	Solanum tuberosum

Tab.2. Potato roots proteins identified from drought susceptible cultivar Oberon

No	Reg	Protein	Accession	Score	Cover	Matches	Mass	Plant
Energy and carbohydrate metabolism								
40		Fructokinase OS	P37829	1239	32	13	33972	Solanum tuberosum
Defence/detoxification								
28	↑	Suberization-associated anionic peroxidase OS	P12437	1170	15	20	39220	Solanum tuberosum
30	↑	Peroxidase	P84714	135	30	1	4670	Cynara cardunculus
31	↑	14-3-3 protein 6 OS	P93211	273	15	8	29063	Solanum lycopersicum
32	↑	Low-temperature-induced cysteine proteinase	P20721	555	12	8	38659	Solanum lycopersicum
33	↑	Heat shock 70 kDa protein, mitochondrial	Q08276	1913	29	27	73317	Solanum tuberosum
34	↑	Catalase isozyme 2 OS	P55312	628	22	14	56928	Solanum tuberosum
38		Patatin-08	Q2MY43	2026	33	39	42717	Solanum tuberosum
44	↑	14-3-3 protein 10 OS	P93207	1266	46	22	28778	Solanum lycopersicum
45	↑	Lactoylglutathione lyase OS	Q42891	615	36	13	20761	Solanum lycopersicum
46	↑	Proteasome subunit alpha type-3 OS	O24362	1544	28	38	27553	Spinacia oleracea
Cell wall								
35	↓	Actin OS	Q05214	3395	45	56	41940	Nicotiana tabacum
37	↓	Alpha-1,4-glucan-protein synthase [UDP-forming]	Q8RU27	959	37	21	42146	Solanum tuberosum



Ryc. 4. Proteins relationship networks of potato Gwiazda (resistant) cultivar subjected to drought

