An STSM Report for the creation and implementation of a database providing information about the use and development of vegetable rootstocks

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Start Date: May 1, 2015

End Date: July 30,2015

Background and Accomplished Aims:

Many vegetable crops such as tomato, eggplant, pepper, cucumber, melons and watermelons are produced on grafted plants where the rootstock and the scion are joined by grafting. This technology allows different traits to be bred into each half of the plant and is vital to protect plants from soil borne diseases and control plant vigor.

A database about the use and development of vegetable rootstocks was required to support the project, "FA1204 Vegetable Grafting to Improve Yield and Fruit Quality under Biotic and Abiotic Conditions". The database created consists of bibliographic data and information about plant genotypes, plant genes, researchers and commercial activities.

The requirements for the created database web application was discussed with Professor Giuseppe Colla, who is the coordinator for the Cost action FA1204 project, and other members of the project in Tuscia University.

As stated in COST Action FA1204 Vegetable Grafting to Improve Yield and Fruit Quality under Biotic and Abiotic Conditions, creation of a web-based dataset is the means of verification for the following milestones of action, which include genetic resource data and rootstock breeding recommendations (M9), Physiological and genetic determinants of root and shoot development and compatibility of rootstock-scion (M10), Rootstock effects on biotic/abiotic stress resistance and resource use efficiency (M11), Rootstock effects on fruit quality (M12).

At this STSM it is aimed to create and enter data to Excel database and to publish at “COST Action FA1204: Food and Agriculture” web site.

Work Summary

First week,

As STSM I took short brief from Mr. Massimo Romanelli, who is the project manager about COST Action FA1204 Vegetable Grafting to Improve Yield and Fruit Quality under Biotic and Abiotic Conditions. He explained what is expected from this STSM and database. Then, I started to search for database info structure. I determined sections and headlines of database from the grafting articles and discussed my results with Prof. Guiseppe Colla, who is The Coordinator of the Editorial Board of FA1204 Cost Action at several times. By the end of the week we agreed that database should include six vegetable scion (tomato, eggplants, melon, watermelon, cucumber and pepper), source info (Records No, Title, Institution/Country, Responsible Person, Supervisor, Aim Of Research, Start/End Date, Cost WG Member, Linked Research, Link), scion section (Records, Subrecords, Vegetable rootstock (Rootstock Crop, Rootstock Crop Origin, Rootstock Crop Variety, Scion, Country Of Grafting, Condition Of Grafting, Grafting Techniques, Grafting Compatibility), Biotic Factors (Fungi Classname, Bacteria Classname, Virus Classname, Nematode Classname), Abiotic Factors (Nutrient uptake "Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg), Sulfur (S), Boron (B), Chlorine (Cl), Copper (Cu), Iron (Fe), Manganese (Mn), Sodium (Na), Zinc (Zn), Molybdenum (Mo), Nickel (Ni), Silicon (Si), Cobalt (Co)" and Nutrient concentration Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg), Sulfur (S), Boron (B), Chlorine (Cl), Copper (Cu), Iron (Fe), Manganese (Mn), Sodium (Na), Zinc (Zn), Molybdenum (Mo), Nickel (Ni), Silicon (Si), Cobalt (Co)", Salinity, Alkalinity, Drought, Flooding, Temperature, Heavy Metal/Other Pollutants "Ca(NO3)2"), Response by vegetable rootstock (Gene, Genotype, Compatibility, Vigor, Vigour effects on scion, Tolerance of the scion, Vegetative growth, Leaf, Stem, Root, Tuber, Fruit Yield, Fruit Quality, Resistance)).

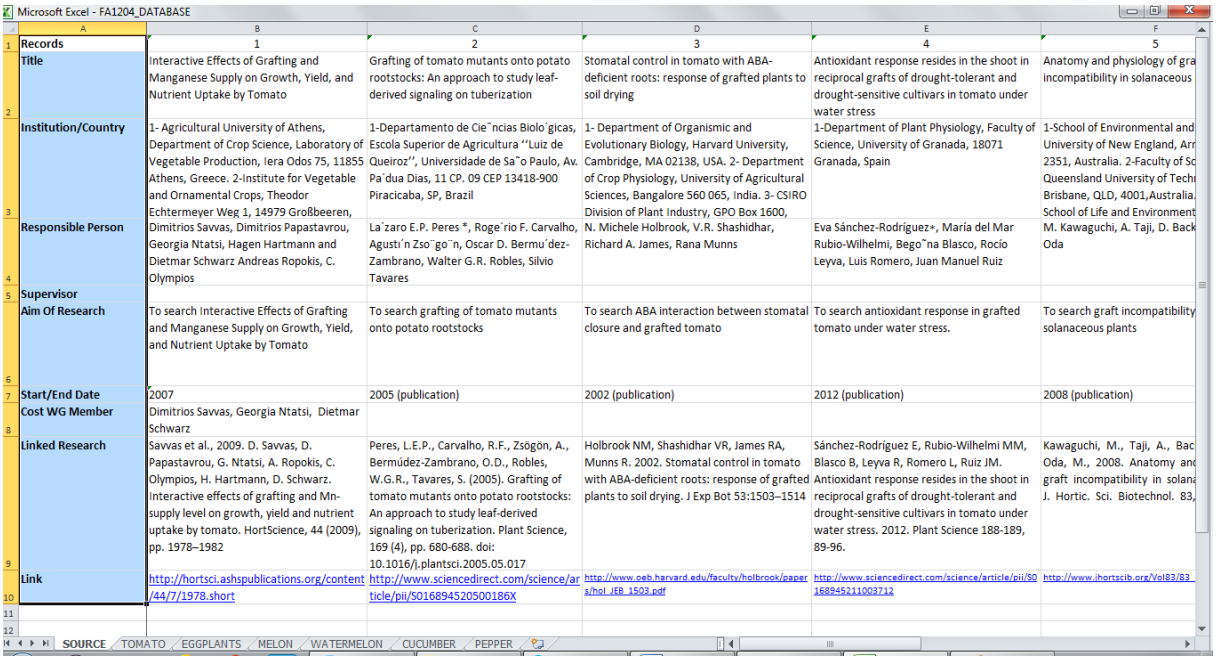
Second week

I prepared a template excel sheet to collect the data from Working Groups for database development. Prof. Giuseppe Colla, Massimo Romanelli, Dr. Georgia Ntatsi who is the Coordinator of the Editorial Board of FA1204 Cost Action and I discussed the distribution way of the template excel sheet. As a result, an e-mail was sent to Working Group Leaders and Co-leaders by Dr. Georgia Ntatsi at 12th May 2015 to collect data and ask their opinion for database. Besides these efforts, I started to take data from grafting articles which is provided by Prof. Giuseppe Colla. It was supplied by flash memory and a directory with one hundred fifty two files about several types of vegetable and grafting.

Third and Forth Weeks

Working Groups didn't supply any files within that period. Also, the e-mail was responded only by Prof. Halit Yetişir from Turkey and Dr. Rohi Cohen from Israel. But, nobody from working group sent the filled template sheet. I could read only thirty articles from one hundred fifty two files due to the lack of experience on grafting and fifteen articles could be used for data base. The others contained either general knowledge about grafting or were unsuitable for database info structure. Database created under object of query of grafting advantage or disadvantage. It needs un-grafted or self-grafted rootstock as control in experience. Sections are evaluated as grafted plants effected or responded positive or negative according to un-grafted/self-grafted plant under biotic-abiotic stress

or compatibility. And the STSM database creation was completed and filled as much as possible. Picture1 and Picture2 show template sheet of database. Picture3 is a view from database using index feature at rootstock crop variety.

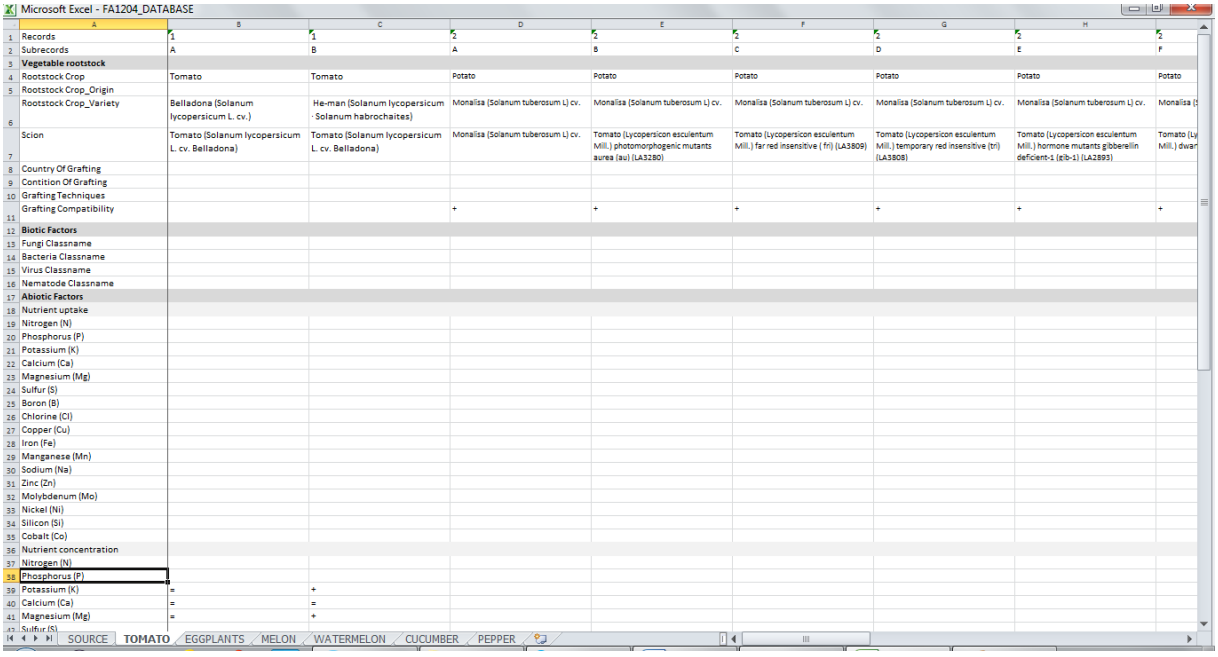


Microsoft Excel - FA1204_DATABASE

	A	B	C	D	E	F
1	**Records**	1	2	3	4	5
2	**Title**	Interactive Effects of Grafting and Manganese Supply on Growth, Yield, and Nutrient Uptake by Tomato	Grafting of tomato mutants onto potato rootstocks: An approach to study leaf-derived signaling on tuberization	Stomatal control in tomato with ABA-deficient roots: response of grafted plants to soil drying	Antioxidant response resides in the shoot in reciprocal grafts of drought-tolerant and drought-sensitive cultivars in tomato under water stress	Anatomy and physiology of gra incompatibility in solanaceous
3	**Institution/Country**	1- Agricultural University of Athens, Department of Crop Science, Laboratory of Vegetable Production, Iera Odos 75, 11855 Athens, Greece. 2-Institute for Vegetable and Ornamental Crops, Theodor Echtermeyer Weg 1, 14979 Großbeeren,	1-Departamento de Cie˜ncias Biolo´gicas, Escola Superior de Agricultura ''Luiz de Queiroz'', Universidade de Sa˜o Paulo, Av. Pa´dua Dias, 11 CP. 09 CEP 13418-900 Piracicaba, SP, Brazil	1- Department of Organismic and Evolutionary Biology, Harvard University, Cambridge, MA 02138, USA. 2- Department of Crop Physiology, University of Agricultural Sciences, Bangalore 560 065, India. 3- CSIRO Division of Plant Industry, GPO Box 1600,	1-Department of Plant Physiology, Faculty of Science, University of Granada, 18071 Granada, Spain	1-School of Environmental and University of New England, Arr 2351, Australia. 2-Faculty of Sc Queensland University of Tech Brisbane, QLD, 4001,Australia. School of Life and Environment
4	**Responsible Person**	Dimitrios Savvas, Dimitrios Papastavrou, Georgia Ntatsi, Hagen Hartmann and Dietmar Schwarz Andreas Ropokis, C. Olympios	La´zaro E.P. Peres *, Roge´rio F. Carvalho, Agusti´n Zso¨go¨n, Oscar D. Bermu´dez-Zambrano, Walter G.R. Robles, Silvio Tavares	N. Michele Holbrook, V.R. Shashidhar, Richard A. James, Rana Munns	Eva Sánchez-Rodríguez*, María del Mar Rubio-Wilhelmi, Bego˜na Blasco, Rocío Leyva, Luis Romero, Juan Manuel Ruiz	M. Kawaguchi, A. Taji, D. Back Oda
5	**Supervisor**					
6	**Aim Of Research**	To search Interactive Effects of Grafting and Manganese Supply on Growth, Yield, and Nutrient Uptake by Tomato	To search grafting of tomato mutants onto potato rootstocks	To search ABA interaction between stomatal closure and grafted tomato	To search antioxidant response in grafted tomato under water stress.	To search graft incompatibility solanaceous plants
7	**Start/End Date**	2007	2005 (publication)	2002 (publication)	2012 (publication)	2008 (publication)
8	**Cost WG Member**	Dimitrios Savvas, Georgia Ntatsi, Dietmar Schwarz				
9	**Linked Research**	Savvas et al., 2009. D. Savvas, D. Papastavrou, G. Ntatsi, A. Ropokis, C. Olympios, H. Hartmann, D. Schwarz. Interactive effects of grafting and Mn-supply level on growth, yield and nutrient uptake by tomato. HortScience, 44 (2009), pp. 1978–1982	Peres, L.E.P., Carvalho, R.F., Zsögön, A., Bermúdez-Zambrano, O.D., Robles, W.G.R., Tavares, S. (2005). Grafting of tomato mutants onto potato rootstocks: An approach to study leaf-derived signaling on tuberization. Plant Science, 169 (4), pp. 680-688. doi: 10.1016/j.plantsci.2005.05.017	Holbrook NM, Shashidhar VR, James RA, Munns R. 2002. Stomatal control in tomato with ABA-deficient roots: response of grafted plants to soil drying. J Exp Bot 53:1503–1514	Sánchez-Rodríguez E, Rubio-Wilhelmi MM, Blasco B, Leyva R, Romero L, Ruiz JM. Antioxidant response resides in the shoot in reciprocal grafts of drought-tolerant and drought-sensitive cultivars in tomato under water stress. 2012. Plant Science 188-189, 89-96.	Kawaguchi, M., Taji, A., Bac Oda, M., 2008. Anatomy an graft incompatibility in solan J. Hortic. Sci. Biotechnol. 83,
10	**Link**	http://hortsci.ashspublications.org/content/44/7/1978.short	http://www.sciencedirect.com/science/article/pii/S016894520500186X	http://www.oeb.harvard.edu/faculty/holbrook/papers/hol_JEB_1503.pdf	http://www.sciencedirect.com/science/article/pii/S0168945211003712	http://www.ihortscib.org/Vol83/83_
11						
12						

SOURCE | TOMATO | EGGPLANTS | MELON | WATERMELON | CUCUMBER | PEPPER

Picture1. A View from Template Source Sheet

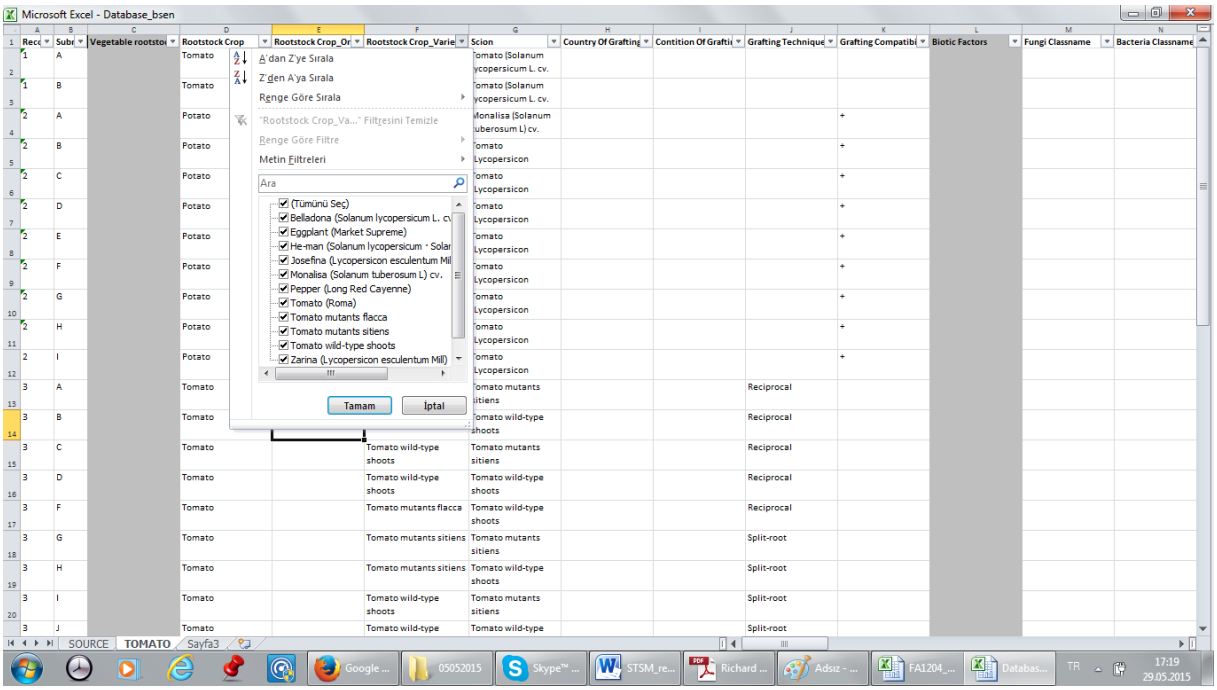


Microsoft Excel - FA1204_DATABASE

	A	B	C	D	E	F	G	H	
1	Records	1	1	2	2	2	2	2	2
2	Subrecords	A	B	A	B	C	D	E	F
3	**Vegetable rootstock**								
4	Rootstock Crop	Tomato	Tomato	Potato	Potato	Potato	Potato	Potato	Potato
5	Rootstock Crop_Origin								
6	Rootstock Crop_Variety	Belladona (Solanum lycopersicum L. cv.)	He-man (Solanum lycopersicum · Solanum habrochaites)	Monalisa (Solanum tuberosum L) cv.	Monalisa (Solanum tuberosum L) cv.	Monalisa (Solanum tuberosum L) cv.	Monalisa (Solanum tuberosum L) cv.	Monalisa (Solanum tuberosum L) cv.	Monalisa (
7	Scion	Tomato (Solanum lycopersicum L. cv. Belladona)	Tomato (Solanum lycopersicum L. cv. Belladona)	Monalisa (Solanum tuberosum L) cv.	Tomato (Lycopersicon esculentum Mill.) photomorphogenic mutants aurea (au) (LA3280)	Tomato (Lycopersicon esculentum Mill.) far red insensitive (fri) (LA3809)	Tomato (Lycopersicon esculentum Mill.) temporary red insensitive (tri) (LA3808)	Tomato (Lycopersicon esculentum Mill.) hormone mutants gibberellin deficient-1 (zib-1) (LA2893)	Tomato (Ly Mill.) dwar
8	Country Of Grafting								
9	Contition Of Grafting								
10	Grafting Techniques								
11	Grafting Compatibility			+	+	+	+	+	+
12	**Biotic Factors**								
13	Fungi Classname								
14	Bacteria Classname								
15	Virus Classname								
16	Nematode Classname								
17	**Abiotic Factors**								
18	Nutrient uptake								
19	Nitrogen (N)								
20	Phosphorus (P)								
21	Potassium (K)								
22	Calcium (Ca)								
23	Magnesium (Mg)								
24	Sulfur (S)								
25	Boron (B)								
26	Chlorine (Cl)								
27	Copper (Cu)								
28	Iron (Fe)								
29	Manganese (Mn)								
30	Sodium (Na)								
31	Zinc (Zn)								
32	Molybdenum (Mo)								
33	Nickel (Ni)								
34	Silicon (Si)								
35	Cobalt (Co)								
36	Nutrient concentration								
37	Nitrogen (N)								
38	Phosphorus (P)								
39	Potassium (K)	=	+						
40	Calcium (Ca)	=	=						
41	Magnesium (Mg)	=	+						
42	Sulfur (S)								

SOURCE | TOMATO | EGGPLANTS | MELON | WATERMELON | CUCUMBER | PEPPER

Picture2. A View from Template Scion Sheet



Picture3. A View from Database and Usage.

Conclusion

Database and template sheet were successfully created at this STSM period. But full data entrance could not be achieved due to lack of communication or misunderstanding. After this stage, it'll be more easy to fill database and make it available for end users if the contribution of all members can be provided.