



COST ACTION FA1204
Vegetable Grafting to Improve Yield and Fruit Quality
Under Biotic and Abiotic Stress Conditions

STSM Scientific Report¹

COST STSM Reference Number: COST-STSM-FA1204-30722

Period: 2016-02-09 to 2016-04-10

STSM type: Regular (from Germany to Israel)

STSM Applicant: Dr. Dietmar Schwarz, Leibniz Institute for Vegetable and Ornamental Crops, D-14979 Grossbeeren (DE); schwarz@igzev.de

STSM Topic: Evaluation of cucurbit rootstock germplasm

Host: Dr. Roni Cohen, Neve Ya'ar Research Center, ARO; Ramat Yishay 30095, Israel; ronico@volcani.agri.gov.il

Index of Content:

1. Purpose of the STSM:

The main purpose of the STSM was to be involved in a cucurbit group that is dedicated to grafting projects and to learn from their experience and expertise. The group led by Yaakov Tadmor at Neve Ya'ar (ARO, Israel) works on various topics related to cucurbits. Large part of it is devoted to grafted cucurbits and the several scientists in this group have substantial knowledge and experience on cucurbit rootstock breeding and use/cultivation under (a)biotic stress conditions. Thus, my work focused particularly on melon.

Within this collaboration a joint manuscript had to be finished and we wanted to discuss the possibilities for a further collaboration.

Finally, we wanted to share our expertise in two joint experiments related to salinity and disease tolerance of grafted cucurbitaceae.

2. Description of the work carried out during the STSM:

Corresponding to the specific objectives the following work was carried out:

A. *Introduction into the breeding program on cucurbit rootstocks, including into transcriptome analyses of scions and rootstocks.*

¹ The grantee is required to submit a short scientific report to the host institution (for information) and MC Chair (or to the STSM coordinator) for approval within 30 days after the end date of the STSM.

The failure to submit the scientific report within 30 days will effectively cancel the grant; The MC Chair (or the STSM coordinator) is responsible for approving the scientific report and informing the Grant Holder that the STSM has been successfully accomplished.

After receipt of the approval by email, the Grant Holder will execute the payment of the grant.



In several talks and discussions with Yaakov Tadmor, Amit Gur, Harry Paris, Menahem Edelstein, and Roni Cohen I received insight in their approaches and projects.

Moreover, during my stay I had the opportunity to visit several breeders and to discuss possible collaboration (see 4.):

- Syngenta. Tomato breeders Dr. Amit Shiftan and Dr. Hadar Less
- Hazera. Breeder plant pathologist Dr. Zahi Paz.
- Soli. Breeder Gadi Leibowitz.

I was invited by Amnon Koren (Hishtil Nurseries) to join him in field trips and to learn more about his advisory work on grafted plants for farmers and experiment stations.

B. Selecting Cucurbita maxima and C. moschata candidate accessions from the available germplasm collection for tests on salinity tolerance and resistance to R. solani.

Selection is aimed to find resistant and susceptible rootstocks to various (a)biotic stresses in order to find genes related to the different performance. At a later stage these genes can be used as molecular markers for breeding.

C. Carrying out experiments.

I have been involved in two experiments (as planned) carried out by the master student Yarden Dror (he also participated in the training school in Wageningen, NL, April 2016) and supervised by Menahem Edelstein (salinity exp.)

Three field experiments were discussed during my visit but planted shortly after I left.

1. Watermelon - Evaluating the performance of two watermelon scions (mini and regular size), grafted on 4 different rootstocks.

2. Watermelon – Planting 4 combinations of grafted watermelon for evaluating differences in gene expression. Foliage and fruits will be samples 3 times during the growing season and RNA will be extracted.

2. Melon - Evaluating the contribution of hybrid rootstocks and their parent to the performance of grafted melons. The hybrids "542" and "Gad" and their relative parents are used as rootstocks.

D. Learning about different bioassays to analyze induced resistance.

We have some preliminary results showing that the rootstocks are inducing resistance to the scion. The resistance induction phenomenon is highly related to the external conditions. Therefore, we have to calibrate the system before getting to detailed experiments. We are trying to learn how to inoculate melon plants with two pathogens, *Macrophomona phaseolina* and *Fusarium oxysporum* f. sp. *radices cucumerinum*. This includes different inoculation methods in different plant ages and under different climatic conditions.

E. Finishing the manuscript on Inter-specific Cucurbita rootstocks.

Done. See 3. and 5.

F. Editing the book on Vegetable Grafting and finalizing the chapter on (a)biotic stresses.

Done. See 3.

3. Description of the main results obtained:

Corresponding to the specific objectives the following results were obtained:

1. The knowledge gained will be applied in my further work in tomato rootstock research related to low temperature (genetic mapping).
2. With the Soli company a project was discussed and also a possible collaboration with Syngenta (see 4.).
3. During my stay, two climate chamber experiments were carried out by cand. Msc. Yarden Dror. The first data are available as seen in the appendix.
4. Based on the discussion of the use of rootstocks under conditions of organic pollutants Menahem Edeltstein and myself discussed a future collaboration. Thus, Dr. Edeltstein is planning a Sabbatical visit at the IGZ Großbeeren where we want to collaborate on this topic.
5. Submission of a joint paper. See 5.
6. The work on the book continued. Most of the chapters have been submitted and reviewed. The results and current status was presented during the COST meeting at Bleiswijk, NL (18 April 2016)

4. Future collaboration with the host institution (if applicable):

Collaboration with the host institution will continue in the coming years with a particular emphasis on the improvement of (a)biotic stress tolerance through the use of vegetable grafting to enhance tolerance to environmental stresses.

Collaborations were started and will be continued as follows:

- Amit Gur (Newe Ya'ar) is willing to help with his expertise in my research on low temperature tolerance. In this context we look for future collaboration.
- Gadi Leipowitz (Soli) initiated a joint project on tomato rootstock related to low temperature. I will take start an experiments at the IGZ with promising rootstocks from this company after my return.
- Menahem Edeltstein (Newe Ya'ar) will come for a Sabbatical visit to the IGZ Großbeeren where we want to collaborate on the use of rootstocks to prevent the uptake of organic pollutants.

5. Foreseen publications/articles resulting from the STSM (if applicable):

The results obtained during the visit of Roni Cohen at the IGZ were summarized in a manuscript and finally submitted during my stay to Euphytica and thereafter to PloSOne: **“Interspecific *Cucurbita* rootstocks: performance of hybrids compared to parental lines.”**

The experiments participated in are ongoing and will be finished during the summer. Results will be summarized and we plan to present part of it in the frame of the COST action FA1204 annual meeting in Pula (Croatia), September 2016. If the experiments will be finished successfully, we intend to publish the data in an appropriate journal.



6. Confirmation by the host institution of the successful execution of the STSM:

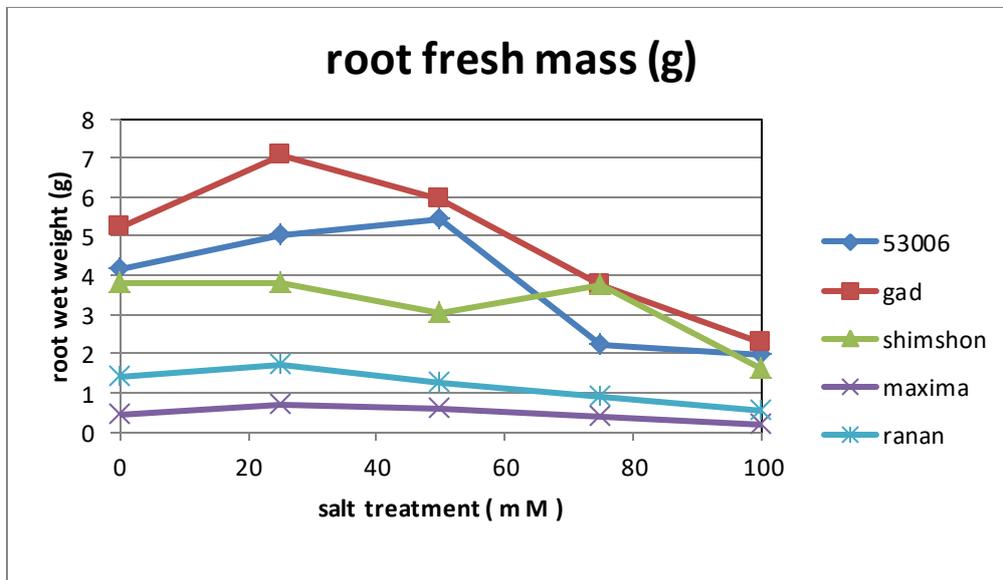
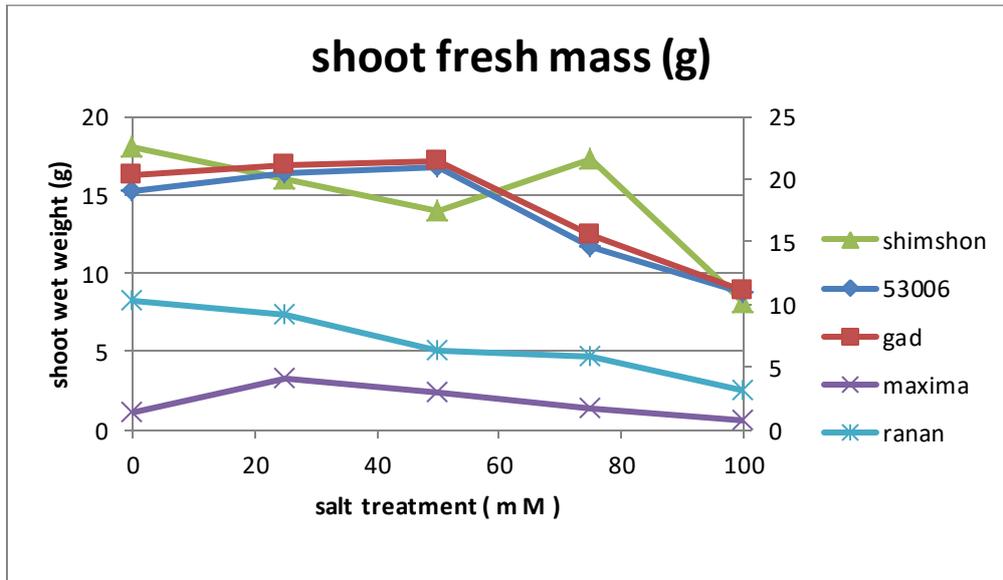
This is to certify, that the STSM applicant, Dietmar Schwarz has worked properly on the plan he presented. Schwarz participated actively in the planning and discussions necessary for accomplishing the experiments and the objectives of the current STSM. He discussed with several specialist of our department their research areas. Moreover, he participated in several research activities of our department and presented two lectures, one at the Research Center at Neve Ya'ar entitled "The future of horticulture in Germany" and the other at the Volcani Center in Bet Dagan entitled: "Benefits and bottlenecks in vegetable grafting".

A handwritten signature in blue ink that reads "Cohen Roni".

Dr. Roni Cohen
Senior Scientist
Neve Ya'ar Reserach Center, ARO Israel

Exp. 1.

Three commercial pumpkin rootstocks ('Gad', 'Shimshon', '53006'), watermelon ('Maxima') and melon ('Ranan') were tested on their growth response to salinity: Five salt treatments (0, 25, 50, 75 and 100 mM NaCl) were applied.



Exp. 2.

Melon was grafted onto three commercial pumpkin rootstocks ('Gad', 'Shimshon', '53006').

Growth response to salinity (0, 60 mM NaCl) was tested.

