Egyptian greenhouse cultivation at a higher level with Dutch technology
T&U project 399

Trip report February 2014

Frank van der Helm, Chris Blok, Rob Meijer, Anne Elings, Wageningen UR Greenhouse Horticulture.
Accompanied by Arjen Janmaat, HortiMaX B.V.

Egyptian hosts:
Dr. Mahmoud Zaki, BioBest
Mr. Hussein Hassan, AllGreen

Terms of Reference

1. Assist the 'Committee to Review the Laws of Importation of BioProducts' in their task to formulate a proposal for a new Ministerial Decree, concerning Production, Export and Import of Biological Control Agents for Agricultural Pests.
2. Advice Mr. Hussein Hassan and his staff of AllGreen with regards to their water, nutrient and crop management.
3. Advice Dr. Mahmoud Zaki and his staff of BioEgypt with regards to their water, nutrient and crop management.
4. Formulation of further 2014 activities.

Itinerary

when	**what**	**who**
Saturday Feb 15	Flight KL553 Amsterdam – Cairo; 20:55 – 2:20*	FvdH, CB, RM, AE
Sunday Feb 16	Meeting with the Committee to Review the Laws of Importation of BioProducts	RM, AE
	Visit AllGreen	FvdH, CB
Monday Feb 17	Meeting with the Minister of Agriculture and Land Reclamation, Prof. Dr. Ayman Farid Abou Hadid, and the Committee to Review the Laws of Importation of BioProducts	RM, AE
	Visit BioEgypt	FvdH, CB
Tuesday Feb 18	Flight KL554 Cairo – Amsterdam; 4:10-8:00	FvdH, CB, RM
	Wrap-up with JA of HortiMaX, writing trip report	AE
Wednesday Feb 19	Flight KL554 Cairo – Amsterdam; 4:10-8:00	AE

1. **Meeting with the Committee to Review the Laws of Importation of BioProducts.**

Venue: Agricultural Research Centre, Giza, Cairo

Goal: Formulate a proposal for a new Ministerial Decree, concerning Production, Export and Import of Biological Control Agents for Agricultural Pests, to replace the current Ministerial Decree no. 368 of 2010.

Rationale: The production, export and import of bca's enhances the sustainability and competitiveness of Egyptian horticulture and agriculture.

Tentative Programme

Time	Subject	Introducer
12:00	Opening, welcome	Dr. Abdel Monaem El Bana – President of ARC Dr. Kamel Nageb – Vice-President of ARC Dr. Hanny Ramdan – Vice-President of ARC Dr Atef Abdelaziz – Director of CLOA
11:25	Egyptian Horticulture and IPM. Necessity and What To Do. + Discussion	Ir. Rob Meijer, *in collaboration with Dr Antoon Loomans (NL Plant Protection Organization) and Johannette Klapwijk (IBMA) and Dr Anne Elings*
13:20	Biological Control in Germany and chanses for Egypt; Legislation and Commercial use. + Discussion	Dr. Sherif Hassan *in collaboration with Dr. Annette Herz JKI Institute, Darmstadt, Germany*
14:20	Lunch	
15:00	Formulation of final recommendation	Chair: Prof. Dr. Essam Agamy
16:30	Closure	

Participants

#	Name	Organization
1	Prof Dr Atef Abdelaziz Hassan Ragab	The Director of the Central Laboratory of Organic Agriculture (CLOA), Coordinator of the Committee
2	Dr. Adel Abdel Latif	The Director of the Plant Protection Institute
3	Dr Mamdouh El Sherif	The Director of the Central Pesticide Lab
4	Prof Dr Ashraf Mahmoud El Marsafi	The Director of the Central Laboratory of Residue Analysis of Pesticides and Heavy Metals in Food
5	Prof Dr Mohamed Refaat Rasmy	The Director of Central Administration of Plant Quarantine
6	Dr Mohamed Abdel Meguid	The Director of Chemical Pesticides Registration
7	Dr Mounir M. El Husseiny	The Chairman of the Egyptian Society for Biological Control of Pests (Cairo University)
8	Dr Tawfik Hafiz Abd El-Moity	Central Laboratory of Organic Agriculture
9	Dr Maisa Iotfe	Deputy Director of the Central Laboratory of Organic Agriculture
10	Dr Ibrahem Hikal	Central Laboratory of Organic Agriculture

11	Dr Faway Abo El Abbas	Cairo University / Ein Shams University
12	Dr Ahmad Hussein El Heneidi	The Vice-President of the Egyptian Society for Biological Control of Pests (Cairo University)
13	Prof Dr Nabile A Hegazy	Cairo University
14	Dr. Abdelaziz Abou El Ela	Cairo University
15	Prof Dr. Essam Agamy	Cairo University
16	Dr. Mahmoud Zaki	The Horticultural Export and Improvement Association
17	Mr. Salah Hegazy	The Horticultural Export and Improvement Association
18	Dr. Sherif Hassan	Julius Kühn Institut, Darmstadt
19	Ir. Rob Meijer	Wageningen UR Greenhouse Horticulture
20	Dr. Anne Elings	Wageningen UR Greenhouse Horticulture
21	Mr. Joost Geijer	Netherlands Embassy
22	Mr. Abdel Hamid El Demerdash	The Horticultural Export and Improvement Association
23	Dr. Fawzy Abo El Abbas	Cairo University

Presentations of Ir. Rob Meijer and Dr. Sherif Hassan:

See annex.

Figure 1. Ir. Rob Meijer and Dr. Sherif Hassan at the Meeting with the Committee to Review the Laws of Importation of BioProducts

Discussion:

- Microbials and pheromones need also to be considered. In NL, microbials form only a small part of IPM, as they require a special microclimate and are therefore less robust than macrobials. Pheromones are an important part . Microbials and pheromones should be added.
- Identity and purity is guaranteed by the plant protection organization of the country of origin.
- Costs of bca's: On the whole, the costs of IPM, including the very rare escape of un-wanted organisms, is much lower than total costs of society for chemical crop protection.
- The positive EPPO list does not need to be the same as the positive list for Egypt. Egypt will have to develop its own positive list. Lists and reports of occurring predatory mites are available.
- A good local lab for assessment of chemical residues is needed.

- Growers need to be convinced as well, and research must serve the private sector.
- Sequence of activities: pest – predator – research – commercial production.
- Local production should be part of the system, besides import of predators.

Formulation of final recommendation:

The proposed articles of the proposed decree were discussed and agreed upon.

Figure 2. Review of the articles of the proposed degree by a sub-group of the Committee to Review the Laws of Importation of BioProducts.

2. Meeting with the Minister of Agriculture and Land Reclamation, Prof. Dr. Ayman Farid Abou Hadid, and the Committee to Review the Laws of Importation of BioProducts

The recommendation of the Committee to Review the Laws of Importation of BioProducts was presented to the Minister, who invited all attendees to the meeting to provide additional comments on the draft decree. All participants except one, supported the recommendation to allow the import, export, use and production of biological agents. The Minister requested a sub-group to review the draft decree and report to him on February 23rd.

In the following days, the process was going to be taken further. [Note Feb 24th: The Egyptian cabinet has resigned. The effect of this on the process is not clear.]

3. AllGreen.

Fertigation

The proper measurement procedure for evaluation of EC and pH was demonstrated (Figure 3) and the All Green equipment was tested in parallel.

Figure 3. Samples of supply water (A), slab water (B) and Drain water (C).

Figure 4. Technical crop discussion.

For the slab measurement we used a squeezing method for sufficiently wet substrate and the 1:2 method for dry samples. The 1:2 method uses a beaker with a 100 ml and a 150 ml line. The beaker is first filled with 100 ml demineralised water. Consequently substrate is added up to the 150 ml line. After shaking one can measure the EC and pH in the solution. Usually the substrate holds 2/3 water and 1/3 solids volume. 2/3 of 50 ml = 33.3 ml water and 1/3 of 50 ml is 16.7 ml solids. This means the original 33.3 ml solution is diluted to 133 ml. The original solution is diluted 133/33.3 = 4 times. Thus the EC in the solution is 4 times the EC measured with the 1:2 method. The pH is usually buffered and only marginally affected by the dilution.

Based on the measurements Table 1 is partly filled (blue figures). The missing data in Table 1 are calculated (orange figures) and reveal the plant uptake. By doing this for all measurements

throughout the year, it becomes clear how much water and nutrients are used for the crop and how much is lost to the environment. Fertilizer efficiency is calculated as well.

Table 1. Calculation of the balances of supply-uptake-discharge for water and nutrients. Measurements in blue, calculated data in orange. Blue figures are observed, orange figures are calculated.

	Row Code	Water (l m^{-2})	Nutrients (g m^{-2}, dS m^{-1}*)	Nutrients (g l^{-1})
Column Code		**A**	**B**	**C**
Irrigation solution	**1**	2.0	2.0	4.0 (A1*B1)
Plant uptake	**2**	1.5 (A1-A3)	1.33 (C2/A2)	2.0 (C1-C3)
Drainage solution	**3**	0.5	4.0	2.0 (A3*B3)

- Using the rule of thumb that 1 $dS.m^{-1}$ is equivalent to 1 $g.L^{-1}$
- The order for calculations is A2, C1, C3, C2, B2

Formula (1) shows the equilibrium between, at the left hand side, bicarbonate (HCO_3^-) and acid (H^+) and, at the right hand side, carbon dioxide (CO_2) and water (H_20). If the carbon dioxide can escape to the air, the equilibrium will shift to the right, acid will change into water and the pH will go up.

$$HCO_3^- + H^+ \Longleftrightarrow CO_2\uparrow + H_20 \qquad (1)$$

In actual measurements the pH in the solution was slowly dropping during the measurement. This means carbon dioxide from the air was absorbed and changed into bicarbonate. This indicates there is very little bicarbonate present in the solution.

Figure 5. Chris Blok (WUR) and Ashraf (AllGreen) doing pH and EC measurements.

Samples of irrigation water, slab water and drain water were taken to be analysed for single elements.

The irrigation pressure is 1 bar, which is rather low. It is advised to measure the water release over the length of a drip line by measuring 10 or more drippers at a regular interval over the line. For example over a line of 50 meters every 5 meters.

Too many roots grew under the slabs and died or suffered when slabs became dry. To prevent this slabs could be put on a side slope of 15-20% towards the drainage gully in the middle (this is a slope corresponding to 15-20 cm per 100 cm or 3-4 cm per 20 cm).

We agreed to intensify our communication by putting set points into a table to be able to later track when and why set points were adapted. Some preliminary set points are: VPD; 1.5, 10, 4.5 (minimum, maximum, average). RH; 45,90, 70.

Stop time is 4 hours before sunset and start is 1 hour after sunup. The irrigation is 180 cc after each 125 J. This was thought to results in 4-6 cycles a day, but 10 to 12 cycles appeared to be given daily. Settings for irrigation were changed to reflect reality better by Arjen Janmaat. In coir the ideal (not always possible) water content is 65% (day) and 50% (night); EC is 3.0 (day) and 4.0 (night). The ratio NH4-N over total-N is 0.15.

The plants at the sides really suffer by either cold air. To diminish this effect a double layer of plastic around the sides of 1-2 meter high might be effective.

Crop growth evaluation

Crop growth was evaluated with the Technical Team of AllGreen. In general crop growth was not well. Many mis-shaped fruits were removed during our visit. Crop vigour and plants were too generative and weak, root growth was limited and root tips were damaged. The latter was most likely due to Pythium, however, it may very well be secondary damage after the real damage from root tip burn from alternating too dry and too wet or high EC situations). Wilting of some pants was observed indicating poor functioning of roots. Another problem was formed by roots under the slabs that showed strong growth and premature death. The position of the slabs is too flat. Water will not flow from under the slab to a drain canal. Also drain openings should be more to the sides, so water does not accumulate under the slabs. Another problem is that soil is not flat enough, so some plants on the same slab are lower than others and receive more water and may become too wet.

Figure 6: Roots growing under the slabs.


Figure 7: Branch fallen out of wire.

The leaf area was too small for the fruit load for many plants. Leaf size showed that leaves have been too small for a long time. Plants were full of young fruits, but the number of fruits was too high and many fruits were mis-shaped. The variation between plant size and vigour was too large. This makes

it very hard to do one right thing for all plants, so climate control, irrigation and crop management is difficult. Crop workers should be instructed to see what plants can carry what fruit load. Too often weak plants still carry too many fruits. Also plants were fallen from the wire by the weight of fruits. Binding the plants was done too late which makes it a difficult task to perform, since plants are easily broken. The technical team was already keeping extra lateral shoots from strong plants to fill the gaps of weak plants. It will cause even a greater variety in evaporation surface between plants. Crop management is performed every two weeks, but it should for now be intensified to every 10 days and labourers should be trained in plant balance and how to rewire plants that have fallen out of the wire. Perhaps some good workers can get extra training to manage difficult plants. Leaf area was also lost because of pesticide burn damage (challenge) and some spider mite. Leaf aged also too fast in general.


Figures 8 and 9: Great variation and low crop vigour.

It could be concluded that several things could have caused the amazingly generative crop at the moment of visit:

- Too low temperature strategy
- Hormone treatment (performed without our consultation)
- Stress because of drought by power cuts
- Extreme low temperatures resulting from power cuts

Data showed that last two weeks not too many big power cuts occurred during the night, although days of dry slabs have occurred. The hormone treatment can not be undone and no means are available to prevent power cuts, but it can be tested to change temperature strategy.

Production so far is similar to production last year, but this year's production started earlier. Production in January has been very low, but this year's cumulative production until 1st of February was similar to last year. Setting after the first yield peak was bad and many misshaped fruits have been removed at the end of December. New setting was achieved beginning of January, so it was delayed three weeks and next yield is expected end of February, and new setting is expected mid-February, as was observed during the visit (even too much setting).

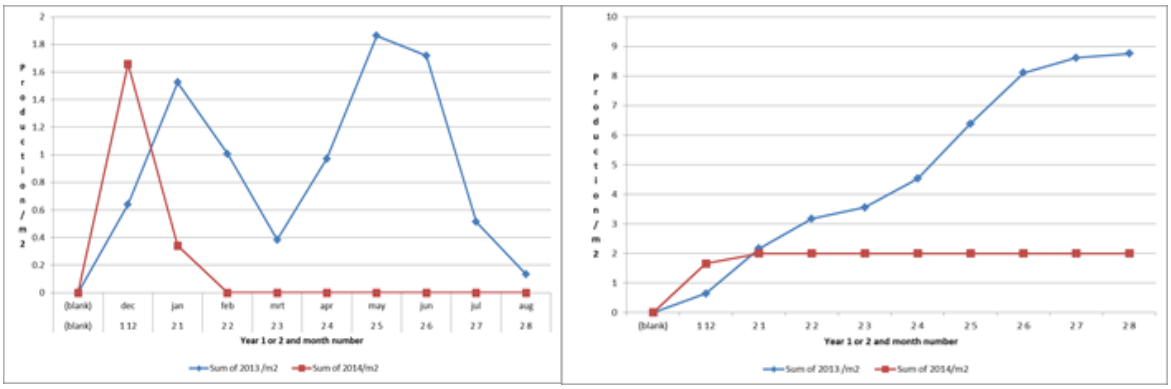


Figure 10 and 11: Monthly production and cumulative monthly production of 2013 en 2014.

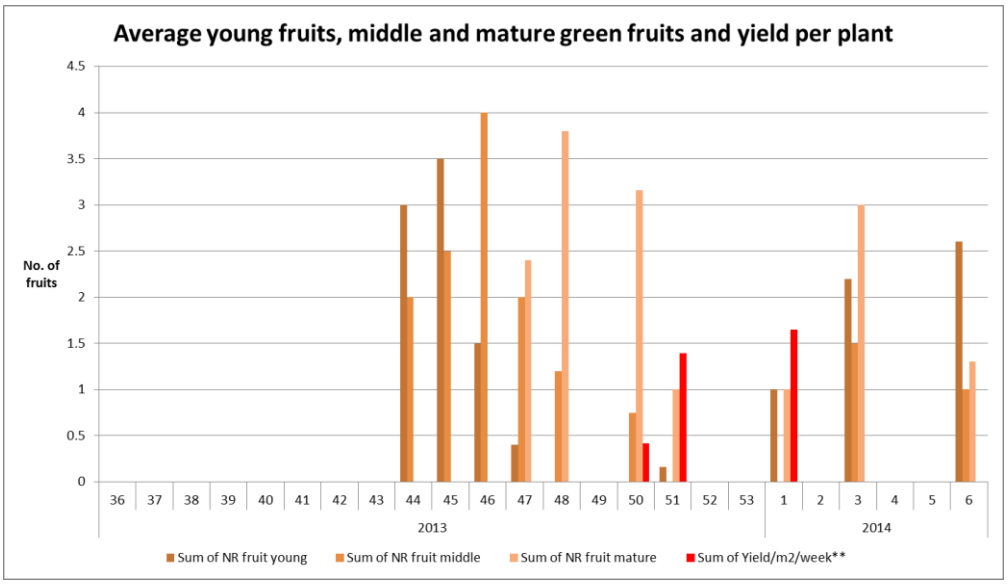


Figure 12: Average setting, growing and harvest of fruits per plant. Setting should have started in week 51 and 52, but did not start until week 1.

The following new strategy is proposed:

- 5 pm. heating T_off=18°C and T_on = 17°C
- 10 pm. T_off=19°C and T_on = 18°C,
- 4 am. T_off=20°C and T_on= 19°C until day temperature is 20°C

also

- on sunny day open sides when greenhouse temp is higher than 22°C
- Close sides in afternoon when temperature is below 23°C
- Close outside screen when radiation is below 50 W/m2

The plants at the side of the greenhouse were smallest. Also problems with spider mites were seen on these places (draft). Ventilation in the greenhouse can only be controlled by opening the sides. It is not a good system. Rooftop ventilation is recommended for the next year. It is also discussed that when availability of power cannot be ensured it is too much risk to grow in hydroponic system and growing in soil should be considered for the next year.

Together with Arjen Janmaat of HortiMaX new tables were made that showed more accurate data by using more appropriate parameters. These tables will be used for future work, and can support grower decision. The accuracy should be tested by the technical team.

Figure 13. Mr. Arjen Janmaat (HortiMaX) working with Hussein (AllGreen) on the climate control computer.

4. BioEgypt

A general tour of the facilities was conducted. We checked in on the technical equipment (Figure 14), the water treatment for recirculation over a slow sand filter (Figure 15) and the water basin (Nile river water, Figures 16 and 17). These elements may be combined with a 5000 m^2 rose greenhouse a visited before (Figures 20-22, previous visit).

Figures 14-16. Nutrient equipment, slow sand filter (6a and 6b) and the water basin.

Figure 17-19: The water basin, HortiMaX fertigation control and drain water collection

Figures 20-22. Rose crop in a compartment fit for recirculation of drain water.

5. HortiMaX

Mr Arjen Janmaat of HortiMaX still supports the project outline that either at the end of the first season, or otherwise during the second season, an open day should be organized at the AllGreen farm. Of course, the crop and greenhouse system need to be in good shape at that moment. Later on, more open days can be organized. From then onwards, HortiMaX will take the lead in the up-scaling process with regards to efficient fertigation technology.

6. Further 2014 activities.

The project plans to have open days at AllGreen. These might be organized at the end of the current season, or during the second season. A prerequisite is a well-performing crop, as this is essential in convincing other growers to adopt technology. HortiMaX should be present, and some fact sheet and/or folders should be available. The target group is primarily growers (through e.g., HEIA), but of course also representatives from ARC, the University, and the Netherlands Embassy are welcome.

Skype consultancies are continued. It will be considered whether some more visits by Frank and/or Chris are financially possible.

Hussein asked for support for the design of his new greenhouses. This can be provided on the basis of a draft design.

If all goes well, an IPM demo can be started in August 2014 at the beginning of the next season. Some points of attention:

a. Location: AllGreen, or elsewhere (with the possible advantage of full focus).
b. Koppert to develop coherent IPM package, including support. Koppert should have the lead, together with the local farm.
c. Involve a student for data processing?

Plans were discussed to explore plans for a training centre, or centre of excellence. An one-pager should be produced for further discussion.

Introduction Rob Meijer

Egyptian Horticulture and IPM
Necessity and What to do

Rob J.M. Meijer (Wageningen UR)
In collaboration with Dr Antoon Loomans (NL PPO) and Johannette Klapwijk (IBMA) and Dr Anne Elings (Wageningen UR)

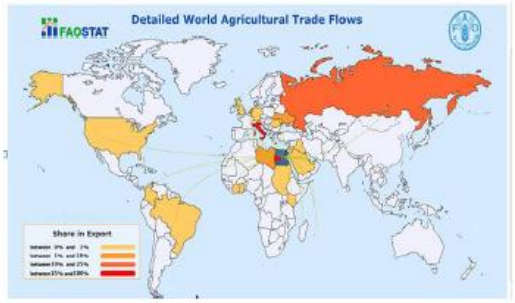
Meeting of the Committee to Review the Laws of Importation of BioProducts
16th February 2014, Cairo (Egypt)

Horticulture in Egypt

- A wide variety of products
- From open field and protected
- For local market and export

Source: HEIA

Egyptian exports of fresh vegetables



Concerns related to Plant Protection Products (PPP's) nowadays

- Higher demands from the export, supermarkets and local market: No or less residues of PPP's - lower MRL´s
- Stricter demands with respect to food safety
- Development of resistance against PPP's
- Too high of PPP's to the environment: effect on surface water
- Risk for the workers
- Trend of less PPP's registered for horticulture

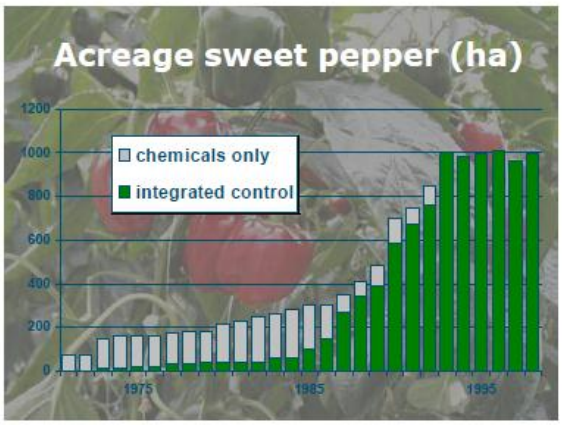
Use of pesticides

Pesticides in greenhouse vegetables in The Netherlands

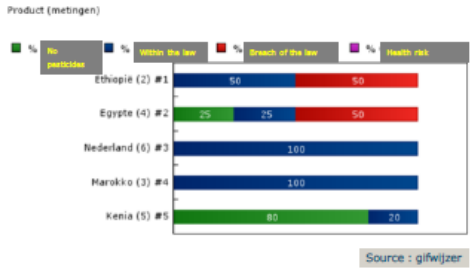
	1995	1998	2004	2008
Tomato	14,9	32,6	8,8	7,2
Cucumber	18,9	15,4	11,5	11
Sweet Pepper	18,9	18,8	3,6	3,5

(active ingredient in kg/ha)

(Source: CBS)

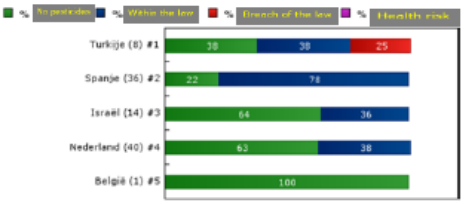


PPP's in samples of green beans exported to NL



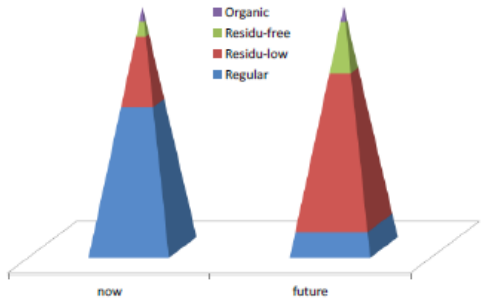
Source : glfwijzer

PPP's in samples of sweet pepper exported to NL



Source: Glfwijzer

Market and Residues



(Source: Greenery)

Recommandations

- Further decrease and smart use of specific PPP´s in horticulture
- Further implementation of IPM
  (*Integrated Pest and Disease Control*)

IPM and Biological Control as a challenge

Integrated pest management consists of

- *Resistant and less susceptible varieties*
- *Prevention and hygiene*
- *Spraying based on monitoring pests and diseases*
- *Biological control with BCA's : biocontrol agents, natural enemies, beneficials*

How to do it: Biological Control in sweet pepper as an example

Pest	Biocontrol agent	Commercial available in Egypt	On the EPPO positive list
Thrips	*Orius laevigatus*	?	yes
	Amblyseius swirskii	?	yes
White fly	*Amblyseius swirskii*	?	yes
	Eretmocerus erem.	?	yes
Red spider mite	*Phytoseiulus pers.*	yes	yes
	Neoseiulus calif.	?	yes
Aphids	*Aphidius colemani*	?	yes

How to realise IPM in horticulture

- Development of legislation and regulation for production, import and export of BCA's
- Demonstrations with BCA's from the positive list of EPPO
- *Collaboration* for IPM implementation and development
  - Institutional level
  - Technical level
  - Commercial level

Need for regulation and legislation ?

- Human health risks are not considered to be of importance: *"not known except for some allergy in production of mites and nematodes"* (Ehlers, 2003)
- Environmental risks: *"More than 5000 introductions of about 2000 species of exotic arthropods in 196 countries during the past 120 years rarely have resulted in negative environmental risks"* (van Lenteren et al. 2006)
- Concerns: Environmental safety: risk for local flora or fauna
  - non-native species (organism)
  - Identity and purity (product)

Standards* of EPPO for the introduction and use of IBCA's

- EPPO Standard PM 6/1: Safe use of biological control
- EPPO Standard PM 6/2: Guidelines for the import and release of non-indigenous biocontrol agents
- EPPO Standard PM 6/3: List of biocontrol agents widely used in the EPPO region: Positive List

*Based on International Standards of Phytosanitary measures issued by IPPC-FAO

EPPO Standard PM 6/3 "Positive List"

Contains 134 species of natural enemies

either

- indigenous/established widespread

or

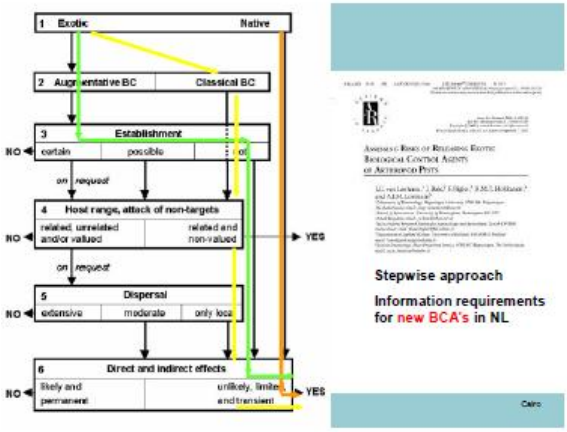
- Released in > 5 countries for > 5 years
- No negative effects recorded

Evaluated and updated yearly by EPPO/IOBC panel

EPPO Standard PM 6/3: Positive list

Approach for the use of I(nvertebrate) BCA´s

1. Free use of IBCA´s which are indigenous or established: *Positive list of Egypt*
2. Guided introduction (e.g. on farm experimentation) of IBCA´s, which are used elsewhere widely and safely
3. Registration procedure for new, rather unkown IBCA´s



Import: Identity and purity are guaranteed

- Every shipment is accompanied by a Phytosanitary Certificate
- Certified producers are under supervision of national Plant Protection Service
- No quarantine organisms are used in production
- Protocols in rearing ensure safe product
  - Strict hygiene protocol
  - Secured rearing units

Quarantine is not necessary for IBCA´s from positive list; no quarantine for IBCA's in any country

Important issues for regulation and import/ export of biocontrol products

- Biocontrol is a **system**
  - different beneficials against different pests
  - When one part missing, system disturbed
- Biocontrol products are **delicate**
  - Shelf life is short
  - Any delay in handling affects quality negative

Smooth and quick import/export procedure required

Summarizing .....

- Spreading IPM is an opportunity for Egyptian horticulture
- BCA's play a crucial role
- Revision of regulations and legislation
- Demonstrations show the potential of IPM and increase the market
- Collaboration in institutional development and in BCA-use are key factors for success

Questions?

Thank you for your attention

أشكركم على اهتمامكم

Introduction Dr. Sherif Hassan

Biological Control in Germany and chanses for Egypt; Legislation and Commercial use

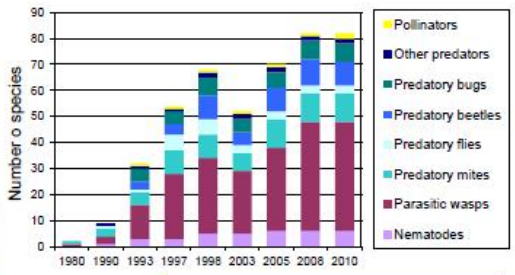
Dr. Sherif Hassan & Dr. Annette Herz
JKI Institute, Darmstadt, Germany

Institute for Biological Control, Darmstadt, Germany www.jki.bund.de

Lists of Commercially available Beneficial Organisms in Germany since 1980

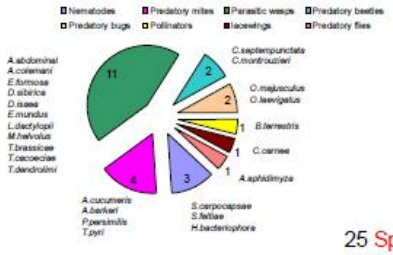
Institute for Biological Control, Darmstadt, Germany www.jki.bund.de

30 years of BC in Germany



Institute for Biological Control, Darmstadt, Germany www.jki.bund.de

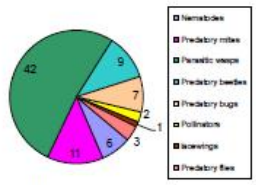
Most used Beneficial Organisms in Germany, 25 spices (EPPO positive list has 64 spp.)



25 Species

Institute for Biological Control, Darmstadt, Germany www.jki.bund.de

Available Beneficial Organisms in Germany, 81 species 2010 (NL 133 spp.; EPPO 64 spp.)



Newly introduced from 2008:

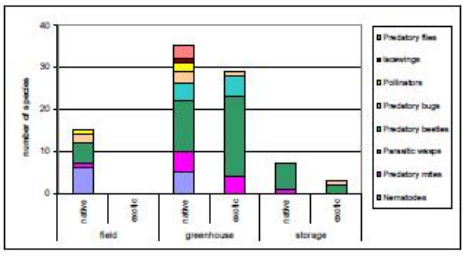
Anagyrus pseudococci
Anthocoris nemorum
Aphelinus asychis
Bracon brevicornis
Encarsia tricolor
Lucilia caesar
Xylocoris flavipes

81 species

64 species on EPPO-List

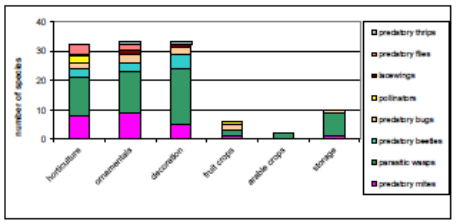
Institute for Biological Control, Darmstadt, Germany www.jki.bund.de

Native and exotic natural enemies used in G.



Institute for Biological Control, Darmstadt, Germany www.jki.bund.de

Number of spices used on crops:



Most used worldwide

Amblyseius swirskii
Amblyseius cucumeris
Amblyseius californicus
Hypoaspis miles
Phytoseiulus persimilis

Chrysoperla carnea

Cryptolaemus montrouzieri

Aphidoletes aphidimyza
Feltiella acaritsuga

Macrolophus sp.

Heterorhabditis bacteriophora
Steinernema carpocapsae
Steinernema feltiae

Aphidius colemani
Aphidius ervi
Dacnusa sibirica
Diglyphus isaea
Encarsia formosa
Eretmocerus eremicus
Trichogramma brassicae
Trichogramma evanescens

Bombus terrestris

Joint EPPO/OIBC Panel Meeting on Biological Control Agents, 3/2010

Egypt
Potential EPPO country

NPPO contact point

Head
Plant Protection and Research Institute
Ministry of Agriculture and Land Reclamation
Dokki, Giza
CAIRO

Nützlingsanbieter DEUTSCHLAND

(List of 21 companies that produce 89 beneficial organisms, 2014)

Nützlinge zu kaufen

Liste der in Deutschland kommerziell erhältlichen Nützlinge

mit **Anwendungsmöglichkeiten** und **Bezugsquellen** auch für **Hobby- und Kleingärtner**

Beneficials for sale

List of useful organisms commercial available

with instruction for use and way to order, also for hobby and small garden)

Table with numbers approved (Dutch) or advised (EPPO) natural enemies:

Family/Order	Approved in the Netherlands	Recognized as safe by EPPO
Coleoptera	19	15
Diptera	4	3
Hemiptera	8	8
Hymenoptera	65	40
Neuroptera	4	1
Thysanoptera	5	3
Arachnida	22	10
Nematoda	6	6

Article (6):

The import and export of the beneficial organisms given in the Positive List (attached) is allowed for specialized experienced companies working in biological control. Permit (7 year renewable) is granted by the "Biological Control and Organic Agriculture Supreme Committee (BCSC). The producing company will certify that the material is free of any contaminates. The Positive List is approved and revised annually by the "Biological Control and Organic Agriculture Supreme Committee (BCSC)". This Committee consults the Natural Enemy Positive List of the Europeans and Mediterranean Organisation for Plant Protection (EPPO) that includes effective widely used natural enemies that are harmless to the environment.

مادة (6)

(يسمح باستيراد وتصدير الكائنات النافعة المتضمنة في القائمة
الممنوح بتداولها – مرفقة – للشركات المتخصصة التي تعمل في مجال المكافحة الحيوية ويعطى
لهذه الشركات
تصريح من (اللجنة العليا للمكافحة الحيوية والزراعة العضوية)، لمدة 7 سنوات قابلة للتجديد.
وعلى هذه الشركات
المنتجة التعهد بخلو شحناتها من أي ملوثات. هذه القائمة تعتمد وتراجع سنويا من قبل (اللجنة العليا
للمكافحة الحيوية
والزراعة العضوية) والتي تراجع فيها قائمة الأعداء الحيوية الآمن تداولها لمنظمة الدول الأوروبية
ودول حوض
البحر المتوسط لوقاية النباتات (EPPO)

Article (8):

If it is necessary to breed insects or stages of organism for use as a host or prey for biological control agents, all necessary measures shall be taken to prevent the escape from breeding laboratories. ~~*It is not allowed to import any stages of these insects (eggs, larvae or pupae) from abroad*~~. Import and export of hosts or pray for the mass production of beneficial organisms is permitted for specialized experienced companies working in biological control. Permit (7 year renewable) is granted by the "Biological Control and Organic Agriculture Supreme Committee (BCSC).

مادة (8)

- إذا كان من الضروري تربية بعض الحشرات أو أطوار بعض الكائنات الحية لاستخدامها كعوائل أو فرائس
- لأجل المكافحة الحيوية فيلزم اتخاذ كافة التدابير لمنع تسرب هذه الحشرات خارج معامل التربية (استيراد العوائل أو الفرائس بغرض
- التربية وإنتاج الكائنات النافعة مسموح به لشركات متخصصة ذات خبرة في مجال المكافحة الحيوية وتقوم اللجنة
- العليا للمكافحة الحيوية والزراعة العضوية بإعطائها تصريح لمدة 7 سنوات قابل للتجديد)

Article (9):

In case of export the production to other countries, the exporter is committed to get the approval of BCSC before starting the exportation in order to determine the extent of exporter compliance with provisions of consignment freedom of strange insects and impossibility of insects to escape from packages during plant quarantine inspection in the importing country and others described in the Explanatory Memorandum.

Article (4):

Specialized official authorities in Egypt such as research centers, universities and also Egyptian companies, Egyptian foreign joint companies (the share of the Egyptian participation at least 50% with scientific and technical supervision by Egyptian experts and scientists. Participation of foreigners is conditioned with the approval of the BCSC) has the permit to produce biological control agents which is present in the Egyptian environment including parasitic and predator beneficial insects, or bacterial, fungal and viral microorganisms isolated from Egyptian environment pathogenic to harmful targeted insects not pathogenic to human, farm animals or plants.

List of biological control agents widely used in the EPPO region

Coleoptera: EPPO 14; EGYPT 7
Adalia bipunctata
Aleochara bilineata--
Atheta coriaria
Chilocorus baileyii
Chilocorus bipustulatus--
Chilocorus circumdatus
Chilocorus nigrita--
Coccinella septempunctata--
Cryptolaemus montrouzieri--
Delphastus catalinae
Rhyzobius lophanthae
Rodolia cardinalis--
Scymnus rubromaculatus--
Stethorus punctillum

List of biological control agents widely used in the EPPO region

Diptera: EPPO 3; EGYPT 1
Aphidoletes aphidimyza --
Episyrphus balteatus
Feltiella acarisuga

List of biological control agents widely used in the EPPO region

Hemiptera: EPPO 6; EGYPT 3
Anthocoris nemoralis --
Anthocoris nemorum
Macrolophus pygmaeus
Orius albidipennis --
Orius laevigatus --
Orius majusculus
Heteroptera: EPPO 2
Picromerus bidens
Podisus maculiventris

List of biological control agents widely used in the EPPO region

Hymenoptera: EPPO 48; EGYPT 24
Anagrus atomus --
Anagyrus fusciventris
Anagyrus pseudococci --
Aphelinus abdominalis --
Aphidius colemani
Aphidius ervi --
Aphidius matricariae
Aphytis diaspidis --
+ .....

List of biological control agents widely used in the EPPO region

Neuroptera: EPPO 1; EGYPT 1
Chrysoperla carnea --

Thysanoptera: EPPO 3; EGYPT 2
Franklinothrips megalops --
Franklinothrips vespiformis --
Karnyothrips melaleucus

List of biological control agents widely used in the EPPO region

Acarina: EPPO 11; EGYPT 2

Amblyseius barkeri
Amblyseius degenerans
Amblyseius swirskii
Cheyletus eruditus --
Hypoaspis aculeifer
Metaseiulus occidentalis
Neoseiulus californicus
Neoseiulus cucumeris
Phytoseiulus persimilis
Stratiolaelaps miles
Typhlodromus pyri --

List of biological control agents widely used in the EPPO region

Phytoseiulus persimilis

Synonyms	*Phytoseiulus riegeli, Phytoseiulus tardi*
Family	Phytoseiidae
Main target pests	Tetranychidae (*Tetranychus urticae*)
Original distribution	Mediterranean
Distribution in EPPO	Southern Europe
Date of first use	1968
EPPO countries where used	Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Guernsey, Hungary, Ireland, Italy, Jersey, Jordan, Lithuania, Malta, Morocco, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK
Use	Indoors/outdoors

List of biological control agents widely used in the EPPO region

NEMATODA: EPPO 6; EGYPT 3

Heterorhabditis bacteriophora --
Heterorhabditis megidis
Phasmarhabditis hermaphrodita
Steinernema carpocapsae --
Steinernema feltiae --
Steinernema kraussei

Thank you for your attention

6th Joint EPPO/OIBC Panel Meeting on Biological Control Agents

Saint-Malo (FR), 2013-11-20/21

The Panel considered the draft 'waiting list' of IBCAs which have not yet met the criteria of 5 years use in the EPPO region by at least 5 EPPO countries. It was decided to maintain this 'waiting list' as a Panel working document.

6th Joint EPPO/OIBC Panel Meeting on Biological Control Agents

Saint-Malo (FR), 2013-11-20/21

The Panel discussed the applications for the addition of *Amblyseius andersoni* and *Ephedrus cerasicola* to the EPPO Positive list and approved both of them. The Panel also discussed information available on *Aphalara itadori* and *Steinernema glaseri* in connection with their potential addition to the EPPO Positive list and decided to postpone the decision until more information is available and criteria of the Positive list fully met. No deletions from the Positive list were proposed.