LITHUANIAN INSTITUTE OF HORTICULTURE

LITHUANIAN ACADEMY OF SCIENCE

Abstracts of international scientific conference

DEVELOPMENT OF INTEGRATED PLANT PROTECTION STRATEGIES IN HORTICULTURE

Lithuanian Institute of Horticulture

Babtai, 17–18 September, 2009
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CONFERENCE PROGRAMME

Wednesday, September 16
Arrival and accommodation

Thursday, September 17

800–815 Please meet at 800 a.m. in hotel hall. Bus leaves at 815 a.m.
900–1030 REGISTRATION – Foyer of Institute
Poster should be set up before 1030

1030–1040 OPENING OF THE CONFERENCE WELCOME
Chairman of the Organizing Committee –
Dr. Laimutis Raudonis
Director of the Lithuanian Institute of Horticulture –
Dr. Česlovas Bobinas
Lithuanian Academy of Sciences –
Prof. habil. dr. Veronika Vasiliauskienė

1040–1200 SESION 1
(Oral presentations are limited to 20 min.
including a questions/discussion)
Chairs: Prof. Dr. Leszek B. ORLIKOWSKI,.
Dr. Laimutis RAUDONIS

1040–1100 INTEGRATED PLANT PROTECTION APPLICATION IN HORTICULTURE USING iMETOS WARNING SYSTEM
Laimutis RAUDONIS, Alma VALIUŠKAITĖ,
Elena SURVILIENĖ, Laisvūnė DUCHOVSKIENĖ
Lithuanian Institute of Horticulture

1100–1120 REGISTRATION SITUATION OF NEEMAZAL-T/S IN EU AND OTHER METHODS OF APPLICATION OF NEEMAZAL-FORMULATION
Edmund HUMMEL, Hubertus KLEEBERG
Trifolio-M, GmbH, Germany
11:20–11:40 CONTROL OF CODLING MOTH, Cydia pomonella L., BY “ATTRACT AND KILL” FORMULATION IN BULGARIA
Hristina KUTINKOVA, Vasily DZHUVINOV, Radoslav KOSTADINOV, Veselin ARNAUDOV, Ivan TERZIEV, Ioan PLATON, Smaranda ROSU-MARES
Fruit Growing Institute, Bulgaria

11:40–12:00 WATER AS THE SOURCE OF Phytophthora spp. PATHOGENIC FOR HORTICULTURAL PLANTS
Leszek B. ORLIKOWSKI, Magdalena PTASZEK, leksandra TRZEWIK, Teresa ORLIKOWSKA
Research Institute of Pomology & Floriculture, Poland

12:00–12:40 Coffee Break

12:20–13:00 SESION 2
Chairs: Prof. PhD Hristina KUTINKOVA, Dr. Audrius SASNAUSKAS

12:20–12:40 FIRST EVIDENCE OF Iteronilla perplexans ON DILL (Anethum graveolens) IN BULGARIA
Rossitza RODEVA, Jutta GABLER, Zornica STOYANOVA
Institute of Genetics “Acad. D. Kostoff”, Bulgaria

12:40–13:00 EVALUATION OF AGRONOMICAL CHARACTERS AND RESISTANCE TO FUNGAL DISEASES OF APPLE CULTIVARS
Audrius SASNAUSKAS, Dalia GELVONASKIENĖ
Lithuanian Institute of Horticulture

13:00–13:20 DETECTION AND CHARACTERIZATION OF Cucumber mosaic virus ISOLATED FROM SWEET PEPPERS
Irena ZITIKAITĖ, Marija SAMUITIENĖ
Institute of Botany, Lithuania

13:20–14:30 Lunch
1430–1610 SESSION 3
Chairs: Dr. Edmund HUMMEL, Dr. Elena SURVILIENĖ

1430–1450 BIOLOGICAL ACTIVITY OF PLANT EXTRACTS AND THEIR APPLICATION AS ECOLOGICALLY HARMLESS BIOPESTICIDE
Ivars ZARINS, Maris DAUGAVIETIS, Julija HALIMONA
Institute of Biology, the Agency of Latvian University

1450–1510 TOXICITY OF INSECTICIDES TO PREDATORY MITE Phytoseiulus persimilis IN CUCUMBER
Laisvūnė DUCHOVSKIENĖ, Laimutis RAUDONIS, Rasa KARKLELIENĖ, Roma STARKUTĖ
Lithuanian Institute of Horticulture

1510–1530 MODELS OF Botrytis SPP. DISEASES FORECASTING AND THEIR APPLICATION UNDER LITHUANIAN CONDITIONS
Elena SURVILIENĖ, Alma VALIUŠKAITĖ, Laimutis RAUDONIS
Lithuanian Institute of Horticulture

1550–1610 TOLERANCE OF APPLE PROPAGATION MATERIAL TO HERBICIDES
Darius KVIKLYS
Lithuanian Institute of Horticulture

1610–1630 EFFICACY OF HERBICIDE LENTAGRAN WP FOR CONTROL OF ANNUAL DICOTYLEDONOUS WEEDS IN CABBAGE CROP
Danguolė KAVALIAUSKAITĖ
Lithuanian Institute of Horticulture

1610–1630 Coffee Break

1630–1730 POSTER SESSION
Chairs: Dr. Jutta GABLER, Dr. Danguole KAVALIAUSKAITĖ

1730–1800 GENERAL DISCUSSION OF CONFERENCE
1800–1900 Visit to experimental laboratories of Institute
1900 WELCOME PARTY

Friday, September 18

0900–2000 EXCURSION TO EXCITING LITHUANIAN PLACES
POSTER PRESENTATIONS

1. **OPTIMIZATION OF TIME AND EXPEDIENCY OF Incurvaria capitella CL. NUMBER REGULATION**
   S. YARCHAKOVSKAYA, N. KALTUN
   RUC Institute of Plant Protection, Belarus

2. **CONTROLLING PEAR PSYLLA WITH ABAMECTIN IN BULGARIA**
   V. ARNAUDOV, H. KUTINKOVA
   Institute of Fruit Growing, Bulgaria

3. **THE TOXICITY OF NEEM AGAINST TO THE SNAIL Arianta arbustorum**
   A. PLOOMI, K. JÕGAR, L. METSPALU, K. HIIESAAR, L. LOORITS, I. KIVIMÄGI, E. SVILPONIS, A. LUIK, I. SIBUL
   Estonian University of Life Sciences

4. **EFFECT OF ABAMECTIN AGAINST TWO-SPOTTED SPIDER MITE AND LEAF MINER FLIES IN GREENHOUSE CUCUMBERS**
   L. DUCHOVSKIENĖ, E. SURVILIENĖ
   Lithuanian Institute of Horticulture

5. **INFLUENCE OF NEEM AZAL T/S ON Mamestra brassicae L.**
   Estonian University of Life Sciences

6. **AN INTEGRATED APPROACH OF APPLE SCAB MANAGEMENT USING IMETOS WARNING SYSTEM**
   L. RAUDONIS, A. VALIUŠKAITĖ
   Lithuanian Institute of Horticulture

7. **DIFFERENT FUNGICIDES COMBINATIONS AGAINST APPLE SCAB TO AVOID FUNGUS RESISTANCE**
   M. EIHE, R. RANCANE, L. VILKA
   Latvian Plant Protection Research Centre
8. **SENSITIVITY OF VENTURIA INAEQUALIS POPULATIONS TO THE KRESOXIM-METHYL**  
V. KAMARDZINA  
*RUC Institute of Plant Protection, Belarus*

9. **INFLUENCE OF MATURITY STAGE ON FRUIT QUALITY DURING STORAGE OF ‘SHAMPION’ APPLES**  
N. KVIKLIENĖ, A. VALIUŠKAITĖ  
*Lithuanian Institute of Horticulture*

10. **THE EVALUATION OF RESISTANCE OF SWEDISH SELECTION PLUM HYBRIDS IN FIELD CONDITIONS**  
A. GRAVĪTE, M. SKRĪVELE, E. KAUFMANE, E. RUBAUSKIS  
*Latvia State Institute of Fruit-Growing*

11. **THE POWDERY MILDEW OF STRAWBERRIES IN LATVIA UNDER OPEN FIELD CONDITIONS**  
S. JARMOLIČA, B. BANKINA  
*Latvia University of Agriculture*

12. **INCIDENCE OF FRUIT ROT ON STRAWBERRIES IN LATVIA, RESISTANCE OF CULTIVARS AND IMPACT OF CULTURAL SYSTEMS**  
V. LAUGALE¹, L. LEPSE¹, L. VILKA², R. RANCANE²  
¹Pūre Horticultural Research Centre, Latvia  
²Latvian Plant Protection Research Centre

13. **FIRST REPORT OF PHOMOPSIS SP. ON THE GLOBE THISTLE (*ECHNOPS SPHAEROCEPHALUS* L.)**  
J. GABLER¹, R. RODEVA²  
¹Institute for Epidemiology and Pathogen Diagnostics of the Julius Kühn-Institute (JKI), Germany  
²Institute of Genetics, Bulgarian Academy of Sciences

14. **DIVERSITY OF PATHOGENIC FUNGI IN THE RHIZOSPHERE OF *OXYCOCCUS MACROCARPUS* (AIT.) Pursh**  
A. STANKEVIČIENĖ, V. SNIĘŚKIENĖ, O. RAGAŽINSKIENĖ  
*Kaunas Botanical Garden of Vytautas Magnus University, Lithuania*
15. **POSSIBILITIES OF INTEGRATED MANAGEMENT OF ONION DOWNY MILDEW**  
   G. Bimsteine¹, L. LEPSE², B. BANKINA¹  
   ¹Institute of Soil and Plant Sciences, Latvia University of Agriculture  
   ²Pūre Horticultural Research Centre, Latvia

16. **INFLUENCE OF BORON FERTILIZER AND METEOROLOGICAL CONDITIONS ON RED BEET INFECTION WITH SCAB AND PRODUCTIVITY**  
   O. BUNDINIENĖ  
   Lithuanian Institute of Horticulture

17. **INTERSPECIFIC RELATION PECULARITIES BETWEEN SOIL AND PHYTOPATHOGENIC FUNGI**  
   D. BRIDŽIUVIENĖ, J. REPEČKIENĖ  
   Institute of Botany, Lithuania

18. **NEW HOST PLANTS FOR PHYTOPHTHORA CRYPTOGEA IN POLAND**  
   M. PTASZEK, L. B. ORLIKOWSKI, Cz. SKRZYP CZAK  
   Research Institute of Pomology and Floriculture, Poland

19. **PREVALENCE PECULIARITIES OF AIRBORNE ALTERNARIA GENUS SPORES IN DIFFERENT AREAS OF LITHUANIA**  
   R. MIKALIŪNAITĖ, M. KAZLAUSKAS, L. VERIANKAITĖ  
   Šiauliai University, Lithuania

20. **OCCURRENCE OF RBDV IN LATVIA AND VIRUS ELIMINATION IN VITRO BY CHEMOTHERAPY**  
   N. PŪPOLA¹, L. LEPSE², A. KĀLE¹,  
   I. MOROČKO-BIČEVSKA¹  
   ¹Latvia State Institute of Fruit-Growing  
   ²Pūre Horticulture Research Centre, Latvia

21. **INVESTIGATION OF TOBACCO RATTLE VIRUS INFECTION IN PEONIES (PAEONIA L.)**  
   M. SAMUITIENĖ, M. NAVALINSKIENĖ, S. DAPKŪNIENĖ  
   Institute of Botany, Lithuania
22. **TOXICITY OF BIOPESTICIDES TO GREEN APPLE APHID IN APPLE-TREE**
   L. RAUDONIS, A. VALIUŠKAITĖ, L. DUCHOVSKIENĖ, E. SURVILIENĖ
   Lithuanian Institute of Horticulture

23. **Quassia amara wood extract efficacy on apple sawfly (Hoplocampa testudinea)**
   V. PSOTA¹, J. OUŘEDNÍČKOVÁ²
   ¹Mendel University of Agriculture and Forestry in Brno
   ²Research and Breeding Institute of Pomology Holovousy Ltd, Czech Republic

24. **Susceptibility of apple pests to endotoxin producing Bacillus thuringiensis isolates**
   Z. METLA, R. SESKENA, J. HALIMONA, L. JANKEVICA, I. ZARINS
   Institute of Biology, University of Latvia

25. **Effect of the essential oils on fungi isolated from apples and vegetables**
   E. SURVILIENĖ¹, A. VALIUŠKAITĖ¹, V. SnieškiENĖ², A. STANKEVIČIENĖ²
   ¹Lithuanian Institute of Horticulture
   ²Kaunas Botanical Garden of Vytautas Magnus University, Lithuania

26. **Application of biological insecticide pecilomicine-B for greenhouse pest control**
   A. YANKOUSKAYA
   RUC Institute of Plant Protection, Belarus

27. **Influence of growth regulators on seed germination energy and biometrical parameters of vegetables**
   J. JANKAUSKIENĖ, E. SURVILIENĖ
   Lithuanian Institute of Horticulture
28. **THE EFFECT COIR FIBRE ON POPULATION OF**
*Phytophthora* sp. **HEALTHINESS AND GROWTH**
OF SOME ORNAMENTAL PLANTS
Cz. SKRZYPCZAK
Research Institute of Pomology and Floriculture, Poland

29. **THE INHIBITORY EFFECT OF METHYL JASMONATE**
ON THE GROWTH AND DEVELOPMENT OF
*Fusarium oxysporum* F. SP. *tulipae*
A. JARECKA BONCELA, A. SANIEWSKA
Research Institute of Pomology and Floriculture, Poland

30. **THE EFFECTIVENESS OF OLEJAN 85 EC AGAINST**
CHRYSANTHEMUM AND WILLOW RUST
A. T. WOJDYŁA
Research Institute of Pomology and Floriculture, Poland

31. **ATTRACTIVENESS OF FLOWERING PLANT**
STRIPS FOR NATURAL ENEMIES IN
ECOLOGICAL PRODUCTION
T. KOPTA, R. POKLUDA
Mendel University of Agriculture and Forestry Brno, Czech Republic

32. **INVESTIGATION OF PESTICIDES ACTIONS TO**
POLLINATION OF BUMBLEBEES IN
GREENHOUSE TOMATOES
E. SURVILIENĖ, L. RAUDONIS, J. JANKAUSKIENĖ
Lithuanian Institute of Horticulture

33. **INFLUENCE OF PREPLANT AND VEGETABLE**
CROP ROTATION LINKS ON CARROT YIELD AND
DAMAGE OF PEST
R. STARKUTĖ, L. DUCHOVSKIENĖ, V. ZALATORIUSS
Lithuanian Institute of Horticulture
CONTROLING PEAR PSYLLA WITH ABAMECTIN IN BULGARIA

Veselin ARNAUDOV, Hristina KUTINKOVA
Institute of Fruit Growing, Ostromila str. 12, 4004 Plovdiv, Bulgaria,
E-mail vaarnaudov@abv.bg

Considering pear psylla (*Cacopsylla pyri* L.) resistance to insecticides routinely used in Bulgaria the study was undertaken aimed at improving the system of this pest control. The experiments were carried out in Plovdiv region, South-Central Bulgaria on ‘Buttira Precoce Morettini’ and ‘Beurre Hardy’ pear trees in 2007–2008. Efficacy of a.i. abamectin of a pesticide supposed to be more selective, not harmful to beneficial fauna, was tested against the background of a.i. amitraz as commonly used insecto-acaricide. Post-bloom applications of abamectin provide a significant control of summer populations of pear psylla. There are needed two consecutive sprays of abamectin at the rate of 240 g a.i. per ha applied after bloom on young nymphs of the second generation. These treatments do not kill summer adult forms; however, they cause a significant reduction in density of summer pear psylla eggs and nymphs. Abamectin may be recommended for the integrated pest management programmes in pear production.
POSSIBILITIES OF INTEGRATED MANAGEMENT OF ONION DOWNY MILDEW

Gunita BIMSTEINE1, Līga LEPSE2, Biruta BANKINA1

1 Institute of Soil and Plant Sciences, Latvia University of Agriculture, Liela str. 2, LV-3004 Jelgava, Latvia, e-mail: Biruta.Bankina@llu.lv
2 Pūre Horticultural Research Centre, Abavas str. 2, LV-3124 Pūre, Tukuma distr., Latvia, e-mail liga.lepse@puresdis.lv

Onion downy mildew caused by *Peronospora destructor* is one of the most important onion diseases that require fungicide application. The aim of the research was to find out methods of integrated control of downy mildew in onion. Investigation was carried out in Pūre Horticultural Research Centre in 2008. Three onion hybrids were included in the investigation: ‘Safrane’ F₁, ‘Hypark’ F₁ and ‘Alonso’ F₁. There were investigated three plant protection variants: 1) fungicide applied according to the DACOM Plant Plus decision support system; 2) fungicide used according to spraying scheme; 3) no fungicide was used. Investigation was arranged in 4 replications, each plot was 10 m². Fungicide with active ingredients Metalaxyl and Mankocarb was used in the trials. The vegetation season of 2008 was not favourable for the onion downy mildew development. The first symptoms of the disease were observed only on 30 of July. Differences in development of the disease between varieties were detected. Severity of downy mildew achieved 1.6 % (‘Alonso’ F₁), 3.1 % (‘Hypark’ F₁) and 4.5 % (‘Safrane’ F₁). Technical effectiveness of fungicide application fluctuated depending on varieties and spraying variant: 18.8–93.5 % for DACOM Plant Plus and 62.5–83.9 % for schematic spraying. The most effective disease control was achieved by application of DACOM programme. Further investigations are necessary to obtain consistent results.
Ecological methods of biological control of plant diseases became more and more popular in recent years. The aim of the investigation was to select soil fungi applicable for protection from causative agents of cultural plant diseases. Antagonistic activity of fungi was studied by pairing method using cultural blocs, cultural liquid and volatile metabolites. 43 fungal strains were examined against *Alternaria brassicicola*, *A. radicina*, *A. tenuissima*, *Cladosporium cucumerinum*, *C. tenuissimum*, *Colletotrichum liniola*, *Fusarium culmorum*, *F. oxysporum*, *F. solani* and *Phoma* sp. It was found that 36 of them showed varying degree of antagonistic activity against treated strains. Most strains suppressed the growth of *Cladosporium* genus phytopathogens and the growth of *Fusarium* genus strains was stopped rarely. Some of screened strains excreted fungicidal compounds to cultural liquid (for example, *Trichoderma virens* and *Penicillium* sp.) and some acted through their volatile metabolites (*Arthrinium sphaerospermum* and *Trichoderma virens*). The optimisation of cultivation conditions as well as the choice of duration of cultivation is important factor to fungi ability to produce fungicidal compounds.
INFLUENCE OF BORON FERTILIZER AND METEOROLOGICAL CONDITIONS ON RED BEET INFECTION WITH SCAB AND PRODUCTIVITY

Ona BUNDININĖ
Lithuanian Institute of Horticulture, Kauno 30, LT-54333 Babtai, Kaunas distr., Lithuania, e-mail o.bundiniene@lsdi.lt

Investigations of the additional red beet fertilization with boron fertilizers though leaves were carried out at the Lithuanian Institute of Horticulture, on the calcaric epiphygogleyc luvisol of sandy loam on light loam (IDg8-k / Calc(ar)i- Epiphygogleyc Luvisols – LVg-p-w-cc) in 2006–2007. There was little amount of humus and nitrogen in the soil, big amount of phosphorus, calcium and magnesium, average and big amount of potassium, average and big amount of boron; it was alkaline. There was investigated the influence of various boron fertilizers and meteorological conditions on scab prevalence in root-crops of different red beet cultivars and hybrids. In 2007 scab prevalence and disease intensity both in red beet hybrids and cultivars was 2–3 times smaller than in 2006. The increase of temperature stimulated scab prevalence (for red beet ‘Boro’ F₁ r = 0.88; for red beet ‘Kamuoliai 2’ r = 0.76) and increased intensity (correspondingly r = 0.88 and 0.85), and the increase of precipitation decreased scab prevalence and intensity (scab prevalence correspondingly r = -0.90 and -0.79, intensity r = -0.90 and -0.87). In both years of investigation root-crops of red beet cultivar ‘Kamuoliai 2’ were more infected by scab than red beet ‘Boro’ F₁. Boron fertilizers positively influenced the yield of red beet hybrids and cultivars and decreased scab prevalence and intensity (according to the average data of 2006–2007, on root-crops of red beet cultivar ‘Boro’ F₁ correspondingly 14.2 and 15.0 %, on root-crops of red beet cultivar ‘Kamuoliai 2’ – 23.8 and 6.3 %). Fertilizer Boramin Ca was the most effective to red beet. Economical efficiency of this fertilizer was correspondingly 2.6 and 7.4 %. The increase of scab prevalence and intensity decreased red beet standard yield. The influence on root-crops of cultivar ‘Boro’ F₁ was strong (correspondingly r = -0.91 and r = -0.95), and on root-crops of cultivar ‘Kamuoliai 2’ – average (correspondingly r = -0.44 and r = -0.43).
Investigations were carried out with greenhouse cucumbers at the Lithuanian Institute of Horticulture in 2004–2005. The impact of three applied insecticides Envidor 240 SC (a. i. spirodiclofen 240 g l⁻¹) at the rates of 0.03 and 0.05 %, NeemAzal-T/S (a. i. 1 % azadirachtin A) at the rate of 0.5 % and Agri-50 (a. i. 28 % see weeds) at the rate of 0.3 % were determined on predatory mite *Phytoseiulus persimilis*. There were found significant differences between the number of predatory mites after application of Envidor 240 SC, NeemAzal-T/S and in untreated plants. Envidor 240 SC (0.05 % and 0.03 %) was from moderately toxic (mortality ranged from 50.98–66.67 %) 3 days after treatment to slightly toxic (25.0–48.75 % mortality) 7 days after treatment. Envidor 240 SC was non-toxic 14 days after treatment. Agri-50 and NeemAzal-T/S were only slightly toxic (28.89–33.33 %) 3 days after treatment in 2005. Based on the results, NeemAzal-T/S and Agri-50 may be a useful part of Integrated Pest Management (IPM) programs.
The effect of Abamectin 18 g l\(^{-1}\) against two-spotted spider mite (*Tetranychus urticae* Koch.) and leaf miner flies (*Liriomyza strigata*, *Liriomyza brionae*) was studied in greenhouse cucumbers in 2005–2006. Efficiency of Abamectin 18 g l\(^{-1}\) 0.12 % and 0.1 % against two-spotted spider mite was respectively: 92.24–100 % and 82.8–99.2 %. Efficiency of insecticide Abamectin 18 g l\(^{-1}\) 0.075 % and 0.05 % against two-spotted spider mite was respectively: 81.0–100 % and 72.4–94.0 %. Efficiency of Abamectin 18 g l\(^{-1}\) 0.12 % and 0.1 % against leaf miner flies was respectively: 63.6–80.3 % and 60.4–75.26 %. Efficiency of insecticide Abamectin 18 g l\(^{-1}\) 0.075 % and 0.05 % against leaf miner flies was respectively: 35.9–54.4 % and 30.7–49.6 %. Azadirachtin A 10 g l\(^{-1}\) and Spirodiclofen 240 g l\(^{-1}\) were less effective against two-spotted spider mite and leaf miner flies.
DIFFERENT FUNGICIDE COMBINATIONS AGAINST APPLE SCAB HELPING TO AVOID FUNGUS RESISTANCE

Maija EIHE, Regina RANCANE, Liga VILKA
Latvian Plant Protection Research Centre, Lielvardes str. 36/38, LV-1006
Riga, Latvia, e-mail regina.rancane@laapc.lv

IOBC guidelines for integrated fruit production prescribe use of forecasting systems in direct plant protection. In Latvia, LPPRC, model RIMpro for apple scab *Venturia inaequalis* control was tested from 2003. Following to FRAC guidelines to reduce the risk of fungus resistance developing, from 2007 efficacy of fungicides mixtures (Chorus, a. i. cyprodinil + Dithane NT, a. i. mancoceb; Effector, a. i. dithianon + Candit, a. i. krezoxyym-methyl) and alternately curative or strobilurine – protective fungicides use was tested. In all cases the first protective application before scab ascospores discharge was carried out with Cu product Champion 50. In case of emergency Effector was used during secondary scab infection period. Fungicides registered in Latvia for apple scab control were effective now used as mixture of protective/curative or strobilurine products, alternately, except strobilurine Candit (Qo inhibitor) separately, because fungus resistance appeared in the 3rd season of Candit use. Efficacy of Candit/Effector mixture was on a level with other treatments. Curative product Chorus didn’t lose efficacy after 6 seasons of use, applied no more than 3 times per season. Nevertheless, further strategy of resistance preclusion has to be considered, what require minimal at-risk products use separately. In all the cases fungicide applications, even Chorus/Dithane mixture, were more effective if used before infection. Weather forecast not always was precise and in such cases the number of necessary applications increased. Most frequently under Latvia conditions there are three severe scab infection periods during the total primary infection period, subsequently 3 or 4 fungicide applications were necessary in addition to the first Champion treatment.
The globe thistle is a potential new oil crop. Since it is intended to cultivate it, breeding activities for the selection of suitable accessions have started. Perishing of plants consistently led to losses that are unacceptable in extensive cultivation. The JKI took on the task to analyse still unknown cause of the damage. *Sclerotinia sclerotiorum*, *Fusarium graminearum* and *Botrytis cinerea* were identified as relevant damage factors occurring every year. In 2008, *Phomopsis* identified by its morphological characteristics and by PTA-ELISA was detected for the first time on *E. sphaerocephalus*. The species is not yet identified. The genus *Phomopsis* includes highly pathogenic species, e.g. *Ph. helianthi*. Therefore, the following aspects should be studied mainly: is this a new, possibly dangerous *Phomopsis* species, or is the globe thistle a new host plant for a known *Phomopsis* species? Is the pathogen able to attack other crops, too, and how can it be controlled? First results are reported. The fungus produces white fluffy mycelium, black pycnidia including α-conidia in large quantities and very few β-conidia in agar culture. It causes large necrotic leaf spots and complete perishing of the leaves verified by pathogenicity tests, and it is able to grow on different solid nutrition media (PDA, V8-vegetable juice agar, Cza-pek Dox agar, malt agar, synthetic nutrient-poor agar [SNA] and water agar) in temperatures from 4 °C to 30 °C. PDA was the most suitable medium, and 25 °C – the optimum temperature for colony growth and pycnidia development. Three fungicides (Ortiva, Score and Signum) tested in agar cultures inhibited the colony growth, with Signum showing the strongest effect.
THE EVALUATION OF RESISTANCE OF SWEDISH SELECTION PLUM HYBRIDS UNDER FIELD CONDITIONS

Ilze GRAVĪTE, Mara SKRĪVELE, Edīte KAUFMANE, Edgars RUBAUSKIS
Latvia State Institute of Fruit-Growing, Graudu str. 1, LV-3701 Dobele, Latvia, e-mail ilze.gravite@lvai.lv; www.lvai.lv

In Latvia on Prunus domestica the most important diseases and pests considered to cause significant decrease of yield are shothole (Stigmina carpophila), leaf rust (Tranzchelia spp.), plum sawflies (Hoplocampa minuta, H. flava) and fruit tree red spider mite (Panonychus ulmi). In order to select the most resistant genotypes to important diseases and pests in Latvia a Swedish selection plum hybrids were evaluated under natural field conditions at Latvia State Institute of Fruit-Growing.

The incidence of pest and disease severity was evaluated on eight to nine years old plum trees in 2007 and 2008. Seventeen plum hybrids were evaluated in total. During the winter 2006/2007 a drastic fluctuation of air temperatures was observed. Most of the plum hybrids were harshly damaged during the winter that led to consequent more severe pest and disease damages.

Obtained results showed that hybrids differ significantly in resistance to leaf rust. In average per both years the significant less damages of rust was determined on hybrids 0930B₁, BPr8932, and 1443B₁. The significant smaller shothole damages were on hybrids 0834B₁ and BPr1855. The fruit tree red spider mite was significantly less detected on hybrids BPr8932, BPr1228C, 0834B₁ and BPr1855. These most resistant plum hybrids to important diseases and pests were selected for the further evaluation.
INFLUENCE OF GROWTH REGULATORS ON SEED GERMINATION ENERGY AND BIOMETRICAL PARAMETERS OF VEGETABLES

Julė JANKAUSKIENĖ, Elena SURVILIENĖ
Lithuanian Institute of Horticulture, Kauno 30, LT-54333 Babtai, Kaunas distr., Lithuania, e-mail j.jankauskiene@lsdi.lt

Influence of growth regulators on seed germination energy and biometrical parameters of vegetables was investigated at the Lithuanian Institute of Horticulture in 2007. The seeds of cucumber ‘Krukiai’ F₁, red beet ‘Joniai’, radish ‘Babtų žara’, tomato ‘Arvaisa’ F₁ were soaked in the solutions of growth regulators Biojodis, Biokal 01, Bioforce, Agronom effect, Inzar, Oksichumat, Penergetic p. Control – the seeds soaked in water. After soaking seeds were sown into multicell flats, in which plants were grown for 30 days in greenhouse. It was established seed germination energy and seedling biometrical measurements (plant height, weight, leaf number, leaf area) were carried out. Plant growth regulators Oksichumat, Agronom effect, Bioforce, Penergetic p positively influenced seed germination energy of radish, tomato and the growth and development of cucumber, red beet, tomato and radish seedlings.
THE INHIBITORY EFFECT OF METHYL JASMONATE ON THE GROWTH AND DEVELOPMENT OF
Fusarium oxysporum f. sp. tulipae

Anna JARECKA BONCELA, Alicja SANIEWSKA
Research Institute of Pomology and Floriculture, Pomologiczna 18, 96-100 Skierniewice, Poland, e-mail ajerecka@insad.pl

Jasmonic acid (JA) and its esterified derivative, methyl jasmonate (JA-Me) are naturally occurring compounds that have been identified in a wide variety of plant species. In addition, jasmonates have also been shown to be involved in direct protection from biotic stresses caused by diseases, and are considered to play a central role in the intracellular signalling cascades, which activate inducible plant defences. Thus, JA and JA-Me were found to exhibit a direct antifungal activity, and jasmonates applied as a foliar spray protected potato or tomato plants against a challenge infection with Phytophthora infestans, and barley plants – against infection by Erysiphe graminis f. sp. hordei. It was clearly shown in several systems that JA-Me alone or with ethylene is required for resistance to necrotropic fungi, such as certain Alternaria species (A. brassicicola) and Botrytis cinerea, respectively. The aim of this work was to determine the effect of methyl jasmonate (JA-Me) on in vitro growth of Fusarium oxysporum f. sp. tulipae. Methyl jasmonate applied to the PDA medium at a concentration of 100, 250, 500, 750, 1 000 and 1 250 µg/cm³ limited mycelium growth of Fusarium oxysporum f. sp. tulipae (Fot 242). JA-Me at a concentration of 250 µg/cm³ limited mycelium growth in 57 %. JA-Me at a concentration of 1 250 µg/cm³ totally inhibited mycelium growth of Fot 242 isolate. Spore germination of the pathogen was totally inhibited at the concentration of 1 000 µg/cm³ JA-Me in selective Komada’s medium. The growth and development of fusariosis caused by Fot on tulip bulbs was greatly limited by the JA-Me; at the concentration of 40 µl per 1 000 cm³ JA-Me totally inhibited the symptoms of fusariosis when applied directly after inoculation with Fot.
THE POWDERY MILDEW OF STRAWBERRIES IN LATVIA UNDER OPEN FIELD CONDITIONS

Svetlana JARMOLIČA, Biruta BANKINA

Institute of Soil and Plant Sciences, Latvia University of Agriculture, Liela str. 2, LV-3004 Jelgava, Latvia, e-mail: Biruta.Bankina@llu.lv, lanasvet2@inbox.lv

Mildew of strawberries is a wide-spread disease over the world, but was not detected in Latvia under open field conditions. Mildew of strawberries was noted in 2007 in open field for the first time in Latvia, but regular observations were started in 2008 in Research and Study farm “Vecauce” of LLU. Observations were carried out in different varieties in strawberry plantations of different age. Mildew was determined only in two varieties – ‘Zefyr’ and ‘Kokinskaja rannaja’. Incidence of disease fluctuated from 9–15 %, depending on the age of the strawberry plantation and was higher in three-years-old plantations. Severity of the disease was not high and did not reach 1 point (evaluation scale 0–5 points). Morphological properties of chasmothecia (former cleistothecium) and conidia were described in the autumn of 2008. Systematic of powdery mildew causal agents was sharply changed during last years. We suggested that mildew of strawberries in Latvia was caused by fungus from the genera Podosphaera (former Sphaerotecha), but more detailed investigations are necessary.
INFLUENCE OF NEEMAZAL-T/S ON Mamestra brassicae L.

Katrin JÕGAR, Luule METSPALU, Külli HIIESAAR, Liina LOORITS, Angela PLOOMI, Aare KUUSIK, Anne LUIK
Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences, Kreutzwaldi str. 1, 51014 Tartu, Estonia, e-mail katrin.jogar@emu.ee

The aim of this study was to explore the effects of the botanical insecticide NeemAzal-T/S on Mamestra brassicae, known as important cabbage pest. The experiments were carried out in the experimental garden of the Estonian University of Life Sciences in the summer of 2006. During the experiment the effect of different concentrations and treating methods of the preparation (0.03 % and 0.3 % solution spraying and 0.3 % solution watering) were monitored. During the observation period M. brassicae were found in lower numbers from treated plants than from untreated plants. A comparison of treated variants with control revealed statistically significant differences in the number of M. brassicae. There were no significant differences between the treated variants. Seasonal dynamics of M. brassicae showed that the population peak was in the beginning of July and after that the number of pests started to decrease. Spraying the cabbage with NeemAzal-T/S 0.3 % solution decreased the inhabitation by the cabbage moth. The effect was not as clear in the other treatments. NeemAzal-T/S acted on cabbage moth females as a weak repellent and oviposition deterrent. According to our results, 0.3 % concentration of NeemAzal-T/S was most effective against cabbage moth and spraying was found to be more effective than watering.
As a result of investigations carried out in the industrial orchards in 2000–2006, significant decrease of sensitivity of apple scab agent Venturia inaequalis populations to krezoxym methyl (Strobi) from strobilurine group was determined. In orchard “Kletsky”, Minsk district, in the first year of the application of this fungicide the amount of sensitive isolates has made 100 % and the resistance factor has not increased 24.2. After 4 times of preparation application in 2001 a proportion of sensitive isolates decreased up to 80.2 % and the population resistance factor increased 2.6 times. When Strobi application was stopped in 2002, a tendency to sensitivity decrease has remained: a proportion of sensitive isolates decreased up to 63.3 % and the resistance factor reached 88.4. In orchard “Rassvet”, Brest district, where krezoxym methyl was started to apply since 1998, in 2005 a proportion of the resistant isolates has made 59.2 %, and the population resistance factor was 117.2. When the number of treatments decreased up to one in 2006, the situation has not changed essentially, what proves the progressive loss of V. inaequalis population sensitivity to the fungicide.
In 2007–2008 at the Lithuanian Institute of Horticulture there were carried out the investigations of herbicide Lentagran WP (a. i. pyridate 45 %) efficiency in cabbage crop. The investigated herbicide effectively decreased weed number in cabbage crop. Annual dicotyledonous weeds were sensitive to herbicide Lentagran WP 0.5–2.0 l ha⁻¹. Total number of weeds 14 days after application of herbicide decreased by 51.6–82.3 %, number of annual dicotyledonous weeds decreased by 58.3–82.5 %, air dry weight of weeds decreased by 34.9–67.6 %. The number of annual dicotyledonous weeds in Lentagran WP 0.5–2.0 l ha⁻¹ treatments was essentially lower to compare with untreated and also there was found essentially lower number of annual dicotyledonous weeds in Lentagran WP 2.0 l ha⁻¹ treatment to compare with Butizan 400 2.0 l ha⁻¹ treatment. Especially sensitive to Lentagran WP 0.5–2.0 l ha⁻¹ there was Galinsoga parviflora Cav. (80.4–100 %). Very sensitive to Lentagran WP 2.0 l ha⁻¹ were Matricaria inodora L. (93.7 %) and Stellaria media L. (87.3 %).
REGISTRATION SITUATION OF NEEMAZAL-T/S IN EU AND OTHER METHODS OF APPLICATION OF NEEMAZAL PREPATIONS

Hubertus KLEEBERG, Edmund HUMMEL
Trifolio-M GmbH, Germany, e-mail edmund.hummel@trifolio-m.de

Registration situation in EU. On 8th of December 2008 with decision No. C(2008) 7803 of the European Commission the non-inclusion of Azadirachtin in Annex I of Reg. 91/414 has been published. The publication of the non-inclusion is a result of voluntary withdrawal of the dossier from side of Trifolio-M, because it was not possible to submit the results to the dossier for completion of the same. Trifolio-M has planned to re-submit the dossier in May 2009.

Other methods of applications. Stem injection. The new formulation NeemProTree-5 will be tests for stem injection against Cameraria ohridella and Thaumetopoea processionea.

Drip irrigation. The first results showed that drip irrigation with NeemAzal-Formulation against aphids provided comparable control to 5 foliar applications.

Soil application. The soil application of NeemAzal-T/S in the combination with two predatory mite species to control Frankliniella occidentalis increased corrected mortality ranging from 54 to 85 %. The NeemAzal-U-Formulation developed for root uptake, caused mortality from 70 to 98 %.

Bait application. The bait formulation with NeemAzal-T/S against Rhagoletis cerasi showed the reduction of egg-deposition and the number of hatched larvae.

Hydroponic application. NeemAzal-U applied systemically through the roots of tomato against Trialeurodes vaporariorum reduced the number of each stage of pests by 70–80 %.
Flowering plants strips in agroecosystems can provide floral resources for enhancing natural enemy activity in ecological production of vegetables. This increasingly common method of supplying beneficial organisms, by providing an appropriate habitat and alternative food sources (pollen and nectar), is one of the most powerful ways to minimize economic damage to crops from pests. It is very important to select plant species that maximise the benefit to the parasitoid and have no benefits or only weak ones for the pest. In our experiment the attractiveness of selected flowering species (*Anethum graveolens*, *Tagetes patula*, *Centaurea cyanus*, *Calendula officinalis* and *Vicia faba*) to natural enemies of aphids – ladybeetles, hoverflies and parasitic wasp (*Coccinellidae*, *Syrphidae* and *Ichneumonidae* respectively) was examined. All natural enemies observed visiting, resting or feeding on the flowering plants were counted together. For evaluation the CANOCO software (version 4.5.4) was used. In the given circumstances (plant mixture, environmental conditions) *Centaurea cyanus* can be considered as an attractive food source for ladybeetles (*Coccinellidae*) and *Anethum graveolens* as an attractive food source for both, hoverflies (*Syrphidae*) and parasitic wasp (*Ichneumonidae*). The abundance of these natural enemies on the other evaluated plant species was relatively poor.
CONTROL OF CODLING MOTH BY “ATTRACT AND KILL” FORMULATION IN BULGARIA

Hristina KUTINKOVA\textsuperscript{1}, Vasilii DZHUVINOV\textsuperscript{1}, Radoslav\textsuperscript{1} KOSTADINOV\textsuperscript{1}, Veselin ARNAUDOV\textsuperscript{1}, Ivan TERZIEV\textsuperscript{1}, Ioan PLATON\textsuperscript{2}, Smaranda ROSU-MARES\textsuperscript{2}

\textsuperscript{1}Fruit Growing Institute, Ostromila str. 12, 4004 Plovdiv, Bulgaria, e-mail kutinkova@abv.bg
\textsuperscript{2}Fruit Research & Development Station, Drumul Dumitrei str. 3, 420127 Bistrita, Romania

“Attract and kill” method, using LastCall\textsuperscript{TM} CM, in form of a viscous paste containing codlemone to attract male moths and permethrin to kill them, has been recently proposed as a biological method for controlling codling moth, \textit{Cydia pomonella} L. The trials were carried out in a 0.5 ha apple orchard in South-Central Bulgaria, in 2007–2008. LastCall\textsuperscript{TM} CM was applied five times per season, at the dosage of 3000 droplets per ha each time. “Attract and kill” method retained sufficient level of activity for about 30 days. Fruit damage rate in the trial orchard amounted at harvest only 1.0 % in 2007 and 1.9 % in 2008, whereas in the reference, conventionally treated orchard it reached 18.7 % and 33.8 %, respectively. It has been confirmed that LastCall\textsuperscript{TM} CM shows a high efficacy, regardless of the size of treated area. The “attract and kill” strategy may present a solution for small size orchards and orchards of irregular shape.
TOLERANCE OF APPLE PROPAGATION MATERIAL TO HERBICIDES

Darius KVIKLYS
Lithuanian Institute of Horticulture, Kauno 30, LT-54333 Babtai, Kaunas distr., Lithuania, e-mail d.kviklys@lsdi.lt

Investigations were conducted in the commercial nursery of the Lithuanian Institute of Horticulture. In 2001–2003 herbicides Stomp (pendimethalin, 4 l ha\(^{-1}\)), Goltix (metamitron, 3.0 l ha\(^{-1}\)), Lontrel 300 (0.3 l ha\(^{-1}\)), Agil (propikvizafop, 1.5 l ha\(^{-1}\)), Focus Ultra (cycloxydim, 4.0 l ha\(^{-1}\)), Fuzilade Super (fluazifop, 3.0 l ha\(^{-1}\)) and combination Fuzilade Super (2.0 l ha\(^{-1}\)) and Betanal Progress (phenmedipham, desmedipham and ethofumesate, 2.0 l ha\(^{-1}\)) were tested in apple nursery during the first and second growing season. Herbicides were sprayed directly on plants without mechanical protection. Herbicides Stomp (4 l ha\(^{-1}\)), Agil (1.5 l ha\(^{-1}\)), Focus Ultra (4.0 l ha\(^{-1}\)) and Betanal Progress (2.0 l ha\(^{-1}\)) are safe to use in apple tree nursery. Herbicide Goltix (3 l ha\(^{-1}\)) should be used during the second year of apple growth. Fuzilade Super (3.0 l ha\(^{-1}\)) and Lontrel 300 (0.3 l ha\(^{-1}\)) caused leaf damages of one-year-old apple trees, but did not interfere to the final growth. Interaction between herbicides and cultivars were noticed in the experiment with one-year-old plants.
INFLUENCE OF MATURITY STAGE ON FRUIT QUALITY DURING STORAGE OF ‘SHAMPION’ APPLES

Nomeda KVIKLIENĖ, Alma VALIUŠKAITĖ
Lithuanian Institute of Horticulture, Kauno 30, LT-54333 Babtai, Kaunas distr., Lithuania, e-mail n.kvikliene@lsdi.lt

Influence of fruit maturity on apple cv. ‘Shampion’ storage ability and rot development was investigated at the Lithuanian Institute of Horticulture in 2004–2005. Fruits for storage were harvested 5 times at weekly intervals before, during and after predictable optimum harvest date. Quality changes, presence of storage disorders, mass losses were measured during harvest period and at the end of storage. During investigation period fruit quality parameters changed according to harvest date and were specific for each trial year. Later harvested fruits were softer and had higher content of soluble solids. Fruit storage ability was closely connected with fruit maturity too. Apples were of the best quality at the end of storage when maturity index at picking date was 0.22–0.17. During storage ‘Shampion’ apple rot was caused by Monilinia sp., Gloeosporium spp. and Penicillium spp. On the average apple fruits were mostly infected by fungus of Gloeosporium genus.
INCIDENCE OF FRUIT ROTS ON STRAWBERRIES IN LATVIA, RESISTANCE OF CULTIVARS AND IMPACT OF CULTURAL SYSTEMS

Valda LAUGALE¹, Līga LEPSE¹, Līga VILKA², Regīna RANCĀNE²

¹ Pūre Horticultural Research Centre, Abavas str. 2, LV-3124 Pūre, Tukuma distr., Latvia, e-mail pures_dpc@tukums.parks.lv
² Latvian Plant Protection Research Centre, Lielvardes 36/38, LV–1006 Riga, Latvia, e-mail regina.rancane@laapc.lv

In 2007 and 2008 strawberry plantations in different regions of Latvia were inspected looking for fruit rots. Causal agents of fruit rot were detected at the laboratory of Latvian Plant Protection Research Centre. 28 strawberry plantations were inspected in 2007. In this year weather conditions during strawberry flowering and harvest time were not favourable for the development of the diseases. On the damaged fruits and flowers mostly fungus *Botrytis cinerea* was detected at laboratory. On some fruits rots caused by *Hainesia lynthri*, *Mucor* spp., *Penicillium* spp. were found. Next year 26 strawberry plantations were inspected. *Botrytis cinerea* was detected on samples with damages like pale brown fruit rot, dead flowers and ovaries and dark brown spots on pedicles. Causal agents *Hainesia lynthri*, *Phomopsis obscurans*, *Coniella castaneicola*, *Fusarium* spp., *Mucor* spp., *Rhizopus* spp., *Penicillium* spp. on rotted fruits also were found at laboratory. Susceptibility to *Botrytis* rot of 16 strawberry cultivars was evaluated at the Pūre HRC in 2006–2008. On the average during three production years, cultivars ‘Honeoye’ and ‘Tenira’ had the lowest *Botrytis* incidence, but ‘Venta’ and ‘Bounty’ were the most susceptible among the tested cultivars. In 2008, experiments on extending of strawberry production season using different plant covers, plastic soil mulches, cultivars, and “frigo” plants were started at the Pūre HRC. The first results showed the significant effect of plastic soil mulches and plant covers on reduction of *Botrytis* incidence.
SUSCEPTIBILITY OF APPLE PESTS TO ENDOTOXIN PRODUCING *Bacillus thuringiensis* ISOLATES

Zane METLA, Rita SESKENA, Julija HALIMONA, Liga JANKEVICA, Ivars ZARIŅŠ

Department of Experimental Entomology, Institute of Biology, University of Latvia, Miera str. 3, LV-2169 Salaspils, Latvia

Researches on biological control have been carried out in the Institute of Biology, University of Latvia, Laboratory of Experimental Entomology since 1986. The aim of the present study was to investigate the susceptibility of pest insects: codling moth, fruit tree tortrix moth, fruit tree tortrix (*Lepidoptera, Tortricidae*) and aphids (*Homoptera: Aphididae*) to different strains of *Bacillus thuringiensis*. *B. thuringiensis* isolates obtained from culture collection were used. Larvae of codling moth reared in laboratory on semi-synthetic media were used in experiments. Different amount of *B. thuringiensis* was added to nutrient media. Other insects were collected from nature, kept in the laboratory – in isolators under optimal conditions and reared on natural food, sprayed with different amount of *Bt* preparations. Efficiency of preparations was expressed as the mortality percentage. Presence of *B. thuringiensis* in larval tissues was detected by direct examination of larval tissue smears under light microscope. Isolates were found those produce endotoxin Cry I and cause mortality of Lepidoptera. The results of bioassay demonstrate that LT 50 of preparations was 4 to 5 days. This research has been financially supported by the grants from the Latvian Council of Sciences.
PREVALENCE PECULIARITIES OF AIRBORNE *Alternaria* GENUS SPORES IN DIFFERENT AREAS OF LITHUANIA

Rita MIKALIŪNAITĖ, Martynas KAZLAUSKAS, Laura VERIANKAITĖ

*Department of Environmental Research, Nature Science Faculty, Šiauliai University, P. Višinskio 19-115, LT 77156 Šiauliai, Lithuania, e-mail oikos@fm.su.lt*

The annual, seasonal and hourly distribution of *Alternaria* Ness. spores in the air was measured in three urban areas in Lithuania – Klaipėda, Šiauliai, and Vilnius in 2005–2006. Hirst type 7-day recording spore traps were used for spore fixation. Fungal spores were identified and counted according to 12 transverse traverse method. Duration of spore season was determined using 90 % method. Duration of season ranged from 62 days in Vilnius in 2005 to 97 days in Klaipėda in 2006. The biggest amount of *Alternaria* spores was established in summer and the least one – in winter and spring. Only solitary spores were observed in February, March and April in all aerobiological stations. The total annual amount of *Alternaria* reached 3090 spores in Vilnius aerobiological station in 2005 and 9718 spores in Klaipėda in 2006. The peak of sporification season was recorded in August in all locations and it was from 121 to 707 spores m⁻³. In this month there were observed 51.4–70.3 % of all annual spores counted. The hourly pattern of *Alternaria* spores concentration in August indicated maximum value between 13:00 and 1:00 hours. Minimal amounts were recorded at 5:00–9:00 hours.
Using rhododendron leaf blades, *Phytophthora* spp. was recovered from 4 rivers, 3 reservoirs and 3 canals located in different parts of Poland. Independently of water sources location, *P. citricola* was found in rivers, reservoirs and canals. Detection period and different sources of water had no big influence on *Phytophthora* spp. population density. Occurrence of *P. cactorum*, *P. cambivora* and *P. cinnamomi* in sampling water was influenced by presence of potential host plants near river and in nurseries. Under conditions favourable to the development of *Phytophthora* spp., *P. citricola* dispersed with sprinkling water in 2 hardy ornamental nursery stocks, caused shoot and tip blight of boxwood and thuja.
THE TOXICITY OF NEEM AGAINST TO
THE SNAIL *Arianta arbustorum*

Angela PLOOMI, Katrin JÕGAR, Luule METSPALU,
Külli HIIESAAR, Liina LOORITS, Ivar SIBUL,
Irja KIVIMÄGI, Anne LUIK
Estonian University of Life Sciences, Kreutzwaldi str. 1, 51014 Tartu,
Estonia, e-mail angela.ploomi@emu.ee

Herbivorous land snail *Arianta arbustorum* Linnaeus, 1758 (*Gastropoda, Pulmonata, Helicidae*) has become considerable pest that occurs throughout Central, Eastern and Northern Europe. Commercially available neem formulation NeemAzal-T/S (containing 1 % azadirachtin, Trifolio-M GmbH, Germany) was tested on experimental white cabbage field of the Estonian University of Life Sciences against cabbage pests, including the snail *A. arbustorum*. The formulation was diluted with water and treated in concentrations 0.03 % and 0.3 % (solution/spraying and watering) with weekly intervals. After that the number of snails started to grow and the highest population peak was in the middle of September. All the tested neem concentrations affected the number of snails on the cabbage and were significantly different from control variant. There was no significant difference between treated variants. Both, spraying and watering with NeemAzal-T/S, affected *A. arbustorum* as effective repellent. It can be concluded that all neem treatments could control the snail *A. arbustorum*. 
The effect of quassin (triterpen lakton) on apple sawfly *Hoplocampa testudinea* (Klug, 1814) (*Hymenoptera: Tenthredinidae*) was evaluated in 2008–2009. Trials were done at two localities. The first locality was in Velké Němčice (South Moravia, Czech Republic) with Idared variety. The second locality was in Holovousy (North-East Bohemia, Czech Republic) with Champion variety. Boiling of wood chips from the tropical shrub *Quassia amara* (*Simaroubaceae*) provided extract-containing quassin. Time of treatment was assessed according to the larval development stage in the egg. Trials included single and double application variants. Trial variants were treated when the majority of larvae were just prior to hatching. The second treatment followed 2 to 5 days after the first treatment in case of double application variants. Following dosages were tested: 3 kg, 4.5 kg and 6 kg wood ha$^{-1}$. The potential of *Quassia amara* wood extract to reduce damage caused by *H. testudinea* was confirmed. We concluded that for the field practise the best variant is double application of extract prepared from 3 kg wood ha$^{-1}$. The trail results suggest that in such a case the efficacy can be expected to be up to 50 to 90 %. The right application timing is of a critical importance to good efficacy.

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NEW HOST PLANTS FOR DEVELOPMENT OF
Phytophthora cryptogea IN POLAND

Magdalena PTASZEK, Leszek B. ORLIKOWSKI,
Czesław SKRZYPYCZAK
Research Institute of Pomology and Floriculture, Pomologiczna 18,
96-100 Skierniewice, Poland, e-mail magdalena.ptaszek@insad.pl

The increase of international trade of plant materials creates the possibility of spreading new pathogen species destructive for plants. The studies of Phytophthora spp. conducted during last years in Poland showed the occurrence of 17 species and increasing number of new host plants for these pathogens. One of the most dangerous species is P. cryptogea, known for at least 40 years as the casual agent of foot rot of gerbera. In 2000–2008 the pathogen was isolated from rotted bases and roots of Abies alba, Pinus mugho var. pumilo, Forsythia intermedia, Anthurium andreanum and Lycopersicum esculentum. Losses caused by this species varied from 10 to even 50 %. The objective of this work was to establish the occurrence of mentioned pathogen on Aquilegia discolor, Alstroemeria x hybrida, Sempervivum arachnoideum and pathogenicity of P. cryptogea from different hosts to those plants. Isolates of Phytophthora were identified to species on the base of their growth and morphology and confirmed a classification using PCR with species-specific primes. Results of laboratory trials indicated significant differences in pathogenicity of P. cryptogea from 7 host plants toward alstroemeria, columbine and sempervivum. All isolates colonized tested tissue plants, but the quickest spread of necrosis was observed when isolates of P. cryptogea from A. discolor, G. jamesonii and S. arachnoideum were used. Reaction of alstroemeria plant parts on tested isolates was more differentiated. All tested cultures (except from S. arachnoideum) colonized leaf blades and stem parts of 3 alstroemeria cultivars. Isolates of P. cryptogea from alstroemeria, columbine and anthurium were the most pathogenic.
To determine the incidence and distribution of Raspberry bushy dwarf idaeovirus (RBDV) in Latvia, 27 commercial and varietal collection plantations of *Rubus* spp. were surveyed in the spring of 2007. In total 224 leaf samples from 59 genotypes were collected for analyses. A combination of meristem tip culture with different antiviral compounds was used to test virus elimination possibilities *in vitro* from naturally infected plants of cultivar ‘Babje Leto 2’. Plant samples for RBDV infection and the efficiency of virus elimination were verified by double-antibody sandwich enzyme-linked immunosorbent assay (DAS ELISA) using polyclonal antibodies. The obtained results showed that RBDV was spread in 70 % of surveyed raspberry plantations. The incidence of RBDV in the tested plants was 35 % and varied greatly among the cultivars. Most of the commonly grown cultivars from Eastern Europe, such as ‘Kirzach’, ‘Balzam’ and ‘Sputnica’, were infected with RBDV. Virus was not detected in plant samples of cultivar ‘Tulameen’. RBDV elimination combining meristem culture with ribavirin for all treated plants was unsuccessful. Treatment with Azacytidine and Dicyanamide was effective only for meristem clones originated from one mother plant. It suggests that the particular plants were infected with a stable virus isolate, which cannot be eliminated with chemotherapy and *in vitro* propagation techniques. To develop effective RBDV elimination procedures more work is necessary to characterize the virus isolates infecting raspberry and to optimise *in vitro* techniques. The experiments are being continued.
AN INTEGRATED APPROACH OF APPLE SCAB MANAGEMENT USING IMETOS WARNING SYSTEM

Laimutis RAUDONIS, Alma VALIUŠKAITĖ
Lithuanian Institute of Horticulture, Kauno 30, LT-54333 Babtai, Kaunas distr., Lithuania, e-mail l.raudonis@lsdi.lt

In 2007–2008 in field trials two different apple scab control strategies were compared: the current strategy – conventional disease management (CDM) and integrated disease management (IDM), according to scab infection periods. A new internet based scab warning system iMETOS was used for detection of infection periods and forecast of disease intensity at three levels: light, moderate and severe. According to CDM, apple-trees were sprayed 9 times a season. Scab warning system gave a possibility to optimise the use of fungicides against scab and to reduce to 7–8 instead 9 the total spray applications per season. CDM and IDM gave high scab control in apple-trees and there were not found any essential difference in scab incidence between two control strategies. An efficiency of IDM and CDM against disease incidence on leaves was 90.5–95.1 and 88.5–94.1 %, respectively. The efficiency against disease incidence on fruits raged from 95.1 to 95.6 and 91.2–94.1 %, respectively.
TOXICITY OF BIOPESTICIDES TO GREEN APPLE APHID IN APPLE-TREE

Laimutis RAUDONIS, Alma VALIUŠKAITĖ, Laisvūnė DUCHOVSKIENĖ, Elena SURVILIENĖ
Lithuanian Institute of Horticulture, Kauno 30, LT-54333 Babtai, Kaunas distr., Lithuania, e-mail l.raudonis@lsdi.lt

During two-year trial there was examined the toxicity of biopesticides BioNature R2000 (a. i. Azadirachta indica 210 g l⁻¹, Pinus resinosa 180 g l⁻¹, Ricinus communis), Bioshower (a. i. 100 % fatty acids) and Insecticidal Soap (a. i. 20 % fatty acids) to green apple aphid (Aphis pomi) in apple-tree at the Lithuanian Institute of Horticulture. BioNature R2000, Bioshower and Insecticidal Soap applied to A. pomi were moderately toxic after 3 days and very toxic after 14 days. It is allowed to use biopesticides BioNature R2000, Bioshower and Insecticidal Soap in organic farming in many countries and according to the trial data they could be effectively applied for control of green apple aphid in apple growing.
FIRST EVIDENCE OF *Itersonilia perplexans* ON DILL (*Anethum graveolens*) IN BULGARIA

Rossitza RODEVA¹, Jutta GABLÉR², Zornica STOYANOVA¹

¹ Institute of Genetics, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria, e-mail rrodeva@yahoo.com

² Institute for Epidemiology and Pathogen Diagnostics of the Julius Kühn-Institute (JKI) – Federal Research Centre of Cultivated Plants, D-06484 Quedlinburg, Erwin-Baur-str. 27, Germany, e-mail jutta.gabler@jki.bund.de

A blight disease was detected on dill (cultivar ‘Dukat’) in private greenhouses in Bulgaria. The purpose of this investigation was to describe the symptoms of the disease, to identify the causal agent and to determine the pathogenicity and host range. Initial symptoms were small grey-green spots and wilting of leaf tips. Wilted leaves turned brown and collapsed as the disease developed. Necroses broadened so quickly that entire leaves dried within a short time. Foliage became a blighted making the leaves unsuitable for harvest. A fungus was consistently isolated from symptomatic leaves, petioles and stems of dill. The pathogen grew slowly on nutrient media and formed white to pale cream-coloured colonies, velvety and flat with minimum aerial mycelium. The pathogenicity was confirmed on dill and other Apiaceae hosts. The fungus was identified as *Itersonilia perplexans* on the basis of colony morphology, hyphae with clamp connections and ballistospores. Disease caused by *I. perplexans* has not been found previously either on dill or any other host plants in Bulgaria up till now.
INVESTIGATION OF *Tobacco rattle virus* INFECTION IN PEONIES (*Paonia L.*)

Marija SAMUITIENĖ, Meletėlė NAVALINSKIENĖ, Stasė DAPKŪNIENĖ

*Institute of Botany, Žaliųjų Ežerų 49, LT-08406 Vilnius, Lithuania, e-mail marija.samuitiene@botanika.lt*

The aim of this study was to evaluate the occurrence of peony ring spot disease in the collections of foreign and Lithuanian origin peony cultivars and hybrids and to identify a causal agent of this viral disease. During surveys of ornamental plant collections grown in Lithuania, solitary instances of affected by peony ring spot disease plants have been detected in all collections surveyed. Diseased plants occurred in the similar frequency in cultivars of foreign and Lithuanian origin from species *Peony lactiflora*, *P. lutea*, *P. officinalis*, *P. suffruticosa*. Samples of diseased plants were collected for investigation of disease causal agent. Virus was isolated and identified using classical virological (test-plants, electron microscopy) and modern molecular biology (DAS-ELISA, RT-PCR) methods. Mechanically inoculated test-plants expressed reaction characteristic of *Tobacco rattle virus* (TRV); electron microscopy investigation revealed characteristic of this virus rod-shaped particles of two modal lengths. Data of DAS-ELISA and RT-PCR confirmed TRV infection in naturally infected peony plants and in inoculated test-plants.
EVALUATION OF AGRONOMICAL CHARACTERS AND RESISTANCE TO FUNGAL DISEASES OF APPLE CULTIVARS

Audrius SASNAUSKAS, Dalia GELVONAUSKIENĖ
Lithuanian Institute of Horticulture, Kauno 30, LT-54333 Babtai, Kaunas distr., Lithuania, e-mail a.sasnauskas@lsdi.lt

In 2004–2009 at the Lithuanian Institute of Horticulture blooming period and abundance, trunks cross sectional area, yield, resistance to scab (Venturia inaequalis) and apple blotch (Phylllosticta mali) were studied in 7 apple (Malus × domestica Borkh.) cultivars. Trees were grafted on rootstock B.118 with spacing 4 × 2.5 m. ‘Auksis’ and ‘Cornel Red Feriside’ were the best ones among the tested cultivars. The following apple cultivars were distinguished for particular characteristics: ‘Kim’ – earliest blooming, ‘Winterbanana’ – latest blooming, ‘Connell Red’ – blooming abundance, ‘Connell Red’ – weakest growth, ‘Auksis’ and ‘Connell Red’ – yield in young orchard, ‘Auksis’ and ‘Connell Red’ – resistance to scab, ‘Auksis’ and ‘Connell Red’ – resistance to apple blotch.
THE EFFECT OF COIR FIBRE ON POPULATION OF
*Phytophthora* sp. HEALTHINESS AND GROWTH OF
SOME ORNAMENTAL PLANTS

Czeslaw SKRZYPCZAK
*Research Institute of Pomology and Floriculture, Pomologiczna 18,*
*96-100 Skierniewice, Poland, e-mail czskrzyp@insad.pl*

Two substrates composed of coir fibre and peat moss, one at proportion 40 % to 60 % and second – 20 % to 80 % were used in experiment. Standard substrate consisted mixture of peat moss (70 %) and composted pine bark (30 %). Half amount of each substrate was inoculated with *Phytophthora cinnamomi.* *Rhododendron catawbiense* ‘Nova Zembla’, *Calluna vulgaris* ‘Alba Praecox’ and *Chamaecyparis lawsoniana* ‘Columnaris’ were plated into infested and no infested substrates. Population densities of the pathogen were measured 2 and 18 weeks after planting. After 2 weeks number of colony forming units do not differ among cultivated species, but 16 weeks later the lowest population of *P. cinnamomi* was noticed in substrate with *Chamaecyparis lawsoniana* ‘Columnaris’. In substrate containing 40 % of coir fibre, population level of the pathogen was reduced up to 50 %. Healthiness status of tested species was evaluated at weekly intervals. During first 11 weeks of growing period no significant differences were noticed in diseased plant number, but after winter period almost all plants were colonised by *P. cinnamomi.* Coir fibre influenced the growth of plants. Substrate containing 20 % of coir fibre and 80 % of peat moss significantly increased the height of *Thuja occidentalis* ‘Kórnik’.
At the Lithuanian Institute of Horticulture in 2003–2007 there were investigated the most suitable plants for green manure and evaluated their influence on ecologically grown carrot yield and damage of pests. Experiments were carried out in the experimental field for ecological vegetable growing, in calcareous epihypogleyic luvisol of sandy loam on light loam. It was established that biomass of the plants grown for green manure left in the ploughing layer uneven amount of organic matter. Pea and oat mixture produced the biggest amount of organic matter (43.2 t ha\(^{-1}\)), barley – the least one (24.5 t ha\(^{-1}\)). All the sideral plants influenced humus positively. All the preplants increased carrot yield. The biggest carrot yield (correspondingly 40.4 and 41.2 t ha\(^{-1}\)) was obtained growing them after barley and pea-oat mixture for green manure. In the first year after harvesting of the plants for green manure, when carrot yield was gathered, there was found only very small amount of root-crops damaged by pests (*Psila rosae* Fabr. and *Pemphigus phenax* Born et Blunck). At the end of rotation, i. e. in third year after plant ploughing for green manure, the percent of carrot root-crops damaged by pests increased. The least amount of damaged root-crops was found in carrot, which preplant in the beginning of rotation was barley for green manure.
MODELS OF *Botrytis* spp. DISEASES FORECASTING AND THEIR APPLICATION UNDER LITHUANIAN CONDITIONS

Elena SURVILIENĖ, Alma VALIUŠKAITĖ, Laimutis RAUDONIS
*Lithuanian Institute of Horticulture, Kauno 30, LT-54333 Babtai, Kaunas distr., Lithuania, e-mail e.surviliene@lsdi.lt*

*Botrytis* spp. infection forecasting models Pessl Instruments (Austria) were started to investigate in strawberries and onions at the Lithuanian Institute of Horticulture from 2008. Investigations of the efficiency of models of *Botrytis* spp. diseases forecasting and the harmonization of the implementation of models under Lithuanian conditions was based upon the new Internet system of forecasting. Meteorological stations, the data of which was sent to Pessl Instruments server and are accessible in Internet, are in Pasvalys, Šiauliai, Panevėžys, Kaunas, Klaipėda and Širvintai districts. Primary data showed that in different agroclimatic zones favourable meteorological conditions to *Botrytis* spp. infection were during strawberry ripening and bulb onion maturing. The comparison of the protection systems against *Botrytis* spp. infection revealed that strawberry spraying with fungicides according to the traditional protection system was effective 54 %, and according to iMETOS model – 62 %. Onion spraying with fungicides according to iMETOS model was more exact and effective and reached 78 % (leaf injury) and 80.1 % (bulb injury), comparing with the factual time of disease establishment – 64.5 % and 63.3 %.

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EFFECT OF THE ESSENTIAL OILS ON FUNGI ISOLATED FROM APPLES AND VEGETABLES

Elena SURVILIENĖ¹, Alma VALIUŠKAITĖ¹, Vilija SNIEŠKIENĖ², Antanina STANKEVIČIENĖ²
¹Lithuanian 1 Institute of Horticulture, Kauno 30, LT-54333 Babtai, Kaunas distr., Lithuania, e-mail: e.surviliene@lsdi.lt; a.valiuskaite@lsdi.lt
²Kaunas Botanical Garden of Vytautas Magnus University, Z. E. Žilibero 6, Kaunas, Lithuania, e-mail: v.snieskiene@bs.vdu.lt; a.stankeviciene@bs.vdu.lt

The aim was to investigate the effects of volatile fraction of essential oils from *Picea abies*, *Eucalyptus globulus*, *Rosmarinus officinalis* and volatile fraction of *Abies sibirica* oil on fungi isolated from apple, leek, carrot, onion. Researches were made in 2008–2009. Tested fungi were as follows: *Penicillium roqueforti*, *Aspergillus flavus*, *Aspergillus flavus* var. *oryzae*, *Mortierella hyalina* var. *hyaline*, *Sclerotinia sclerotiorum*, *Sporotrichum aurantiacum*, *Phoma exiqua*, *Clonostachys rosea* f. *catenulata*. All parts of the plant from which fungi were isolated were injured by rot. Fungi of the tested species grew on the potato dextrose agar medium in different colonies, which grew at different speed. The oils were dripped on the covers of Petri dishes. There were three different variations taking the different portions of oil: 0.005, 0.01 and 0.015 ml. It was calculated the inhibitory activeness (R). Volatile fractions of all tested oils inhibited the growth of mycelium of all 8 species fungi. The inhibiting effect depended on: 1) the amount of oil, 2) the species of the plant, from which the oil was isolated, 3) the species of the tested fungi and 4) the incubation period.
INVESTIGATION OF PESTICIDES EFFECT ON POLLINATION OF BUMBLEBEES IN GREENHOUSE TOMATOES

Elena SURVILIENĖ, Laimutis RAUDONIS, Julė JANKAUSKIENĖ

Lithuanian Institute of Horticulture, Kauno 30, LT-54333 Babtai, Kaunas distr., Lithuania, e-mail e.surviliene@lsdi.lt

The study was conducted in three 400–800 m² type greenhouses: Multi Rovero 640 tR, Rovero 961 and Multispan 9.60 SR of the Lithuanian Institute of Horticulture in 2007. Trial data shows that the efficiency of tomato pollination by bumblebees during cultivation season ranged from 83.3 to 87.2 %. The pollination is effective, if there are found 60 % of flowers pollinated by bumblebees. An efficiency of pollination depends on used pesticides and number of hives. Insecticides Aztek 140 Ec (triazamat) a concentration of 1.0 ml l⁻¹, NeemAzal-T/S (azadirachtin A) of 5.0 ml l⁻¹ and fungicides Previcur 607 SL (propamocarb hydrochloride) of 1.5 l ha⁻¹ had not negative affect to bumblebee activity and efficiency of pollination. The effect of pollination and activity of bumblebees was reduced due to the use of Euparen M 50 WG (tolylfluanid) at the rate of 1.5 mg l⁻¹.
ASSESSMENT OF THE EFFICACY OF
OLEJAN 85 EC CONTROLLING CHRYSANTHEMUM
AND WILLOW RUST

Adam T. WOJDYŁA
Research Institute of Pomology and Floriculture, Pomologiczna 18, 96-100
Skierniewice, Poland, e-mail awojdyla@insad.pl

In the protection of chrysanthemum against *Puccinia horiana*, Olejan 85 EC (85 % rapeseed oil) was used at concentrations of 0.5 and 2 %, and applied in 4 spray treatments every 7 days. After the four treatments, Olejan 85 EC was found to have inhibited the development of *Puccinia horiana* by from 1.4 to 3.6 times depending on the concentration, and had caused sporadic, up to almost 37 %, browning and decomposition of telia. In the protection of willow against *Melampsora epitea*, Olejan 85 EC was used at concentrations of 0.5 and 2 %, and applied in 2 spray treatments every 7 days. After the two treatments, Olejan 85 EC was found to have inhibited the development of *Melampsora epitea* by from 2.6 to 13.7 times, and had caused from 10 to 62 % browning and decomposition of uredinia. Olejan 85 EC had proved to have significantly higher effectiveness in the reduction of leaf infection than the product Saprol 190 EC. Taking into consideration the percentage of dried-up uredinia per leaf, Olejan 85 EC had also shown significantly higher efficacy in comparison with the fungicide Saprol 190 EC. At neither of the concentrations used was Olejan 85 EC phytotoxic to the treated plants.
APPLICATION OF BIOLOGICAL INSECTICIDE PECILOMICINE-B FOR GREENHOUSE PEST CONTROL

Alena YANKOUSKAYA
RUC Institute of Plant Protection, Priluki, Minsk region, Belarus, e-mail belizr@tut.by

The estimation of influence of some technological parameters (terms and number of treatments, the interval between them) on biological efficiency of bioinsecticide Pecilomicine-B on greenhouse whitefly (*Trialeurodes vaporariorum* West.) and cucumber midge (*Bradysia brunnipes* Mg.), and also its influence on entomophages encarsia (*Encarsia formosa* Gahan.) and phytoseiulus (*Phytoseiulus persimilis* Ath.) was carried out under greenhouse conditions. It was determined that the most expedient method of Pecilomicine-B application is at the stage of primary settling of greenhouse crop plantings by phytophage: in case with greenhouse whitefly – by the first imago appearance on plant leaves carrying out 2 treatments at 7–14 days interval. Later on, Pecilomicine-B (1 % concentration) is applied up to 4 times considering greenhouse whitefly population dynamics (in case its stable increase). It allows keeping the phytophage population during 1.5–2 months at economically imperceptible level without chemical means of plant protection. Against cucumber midge one should apply the preparation (4 % concentration up to 2 times at 23–27 days interval) at the beginning of pest imago mass flight. In case of combined Pecilomicine-B application under greenhouse conditions (at 7–14 days interval) with phytoseiulus and encarsia it does not render the negative influence on survival, reproduction, parasitic and predatory activity of entomophages and does not decrease the efficiency of their action. Pecilomicine-B application, according to the above mentioned technological parameters, allows constraining the phytophage populations at economic-imperceptible level.
OPTIMIZATION OF TIME AND EXPEDIENCY OF
*Incurvaria capitella* CL. NUMBER REGULATION

Svetlana YARCHAKOVSKAYA, Natallia KALTUN
*RUC Institute of Plant Protection, Priluki, Minsk region, Belarus,
e-mail belizr@tut.by*

Investigations were conducted in black currant plantations (Minsk district) in 1994–2008. The objects of researches were black currant cultivars growing in Belarus and currant bud moth (*Lampronia (Incurvaria) capitella* Cl.). The objective of researches was to develop currant bud moth monitoring system in black currant plantations based on phenological forecast of pest development. There was applied original synthetic phytophage sex pheromone considering a degree of different currant cultivar damage. An algorithm of phenological forecast of currant bud moth development was worked out. It gave an opportunity to determine beforehand the optimum time of registering of caterpillars leaving their wintering places, imago flight dynamics and carrying out a complex of chemical and agrotechnical measures. The attractiveness of the original synthetic phytophage sex pheromones was studied. It was determined that as a dispenser for the synthetic sex pheromone it is preferable to use the insulin cork or rubber black tube with a. i. content 1 mg/dispenser. It is determined that mid-early cultivars (‘Minay Shmyrev’, ‘Partisanka’) under conditions of Belarus are damaged by black currant moth much stronger than the mid and mid-late ones. The least pest-damaged cultivar is mid-late ‘Zolushka’.
The use of plant extracts in the management of plant diseases is gaining importance. Different phytopreparations, which were made on the basis of extractive substances originated from natural and cultivated plant extracts, are described in this study. Collection of phytopreparations consisted of 9 new ones with insecticidal and 8 – with fungicidal properties. Phytopreparations were prepared in different forms: liquid, semi-fluid and paste. Phytopreparations were tested to be ecologically harmless. The fungicidal and insecticidal properties of the phytopreparations were detected under laboratory conditions, in the experimental fields, greenhouses and under conditions of peasant farm. An efficiency of the tested preparations was found to be 55–81 % in experimental fields. Besides, an insecticidal activity of “Fitoeokols-IF” (liquid and paste form) was tested on nine sucking insect species wintering on the bark of fruit trees trunk and basal branches. This activity reached 40–78 %. New phytofungicides were used against distribution of the pathogenic fungus infections on vegetable culture in greenhouses; their efficiency was in the ranges of 65–88 % and 60–80% under laboratory and field conditions, respectively. Fruits, vegetables and planting material may be successfully protected during their long-time storage in storehouses against pathogenic fungus infections with selected phytopreparations, e. g. “Fitoeokols-IF”, “Fitosativum”, and “Fitocapsicum”. Protection efficiency is 58–80 %.
DETECTION AND CHARACTERIZATION OF
*Cucumfer mosaic virus* ISOLATED FROM
SWEET PEPPERS

Irena ZITIKAITE, Marija SAMUITIENĖ
Institute of Botany, Žaliųjų ežerų 49, LT-08406 Vilnius, Lithuania,
e-mail irena.zitikaite@botanika.lt; marija.samuitiene@botanika.lt

*Cucumber mosaic virus* (CMV) causing viral diseases in forage, fruit, ornamental and vegetable crops worldwide has been isolated in Lithuania from sweet pepper (*Capsicum annuum* L.) plants exhibiting mottle-mosaic and distortion of leaves and fruits, and plant stunt symptoms. The plant material was collected in the private gardens of Vilnius, Kaišiadorys, Kėdainiai regions. The identification of CMV has been performed on the basis of determination of host range, symptom expression on the test plant species and morphological properties of the virus particles by the methods of test plants and transmission electron microscopy and using specific oligonucleotide primers in reverse transcription-polymerase chain reaction (RT-PCR). In this work the primers designed on the basis of published sequences were applied for amplification of CMV RNA fragments in RT-PCRs using experimentally CMV infected host plants. The detection of CMV in inoculated test plants was confirmed by RT-PCR technique. Analysis of PCR products in acrylamide gel electrophoresis revealed amplification of about 540 bp (base pair) fragments, which were in agreement with size of the fragment expected from the sequence data.
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