



Serological and Molecular Detection of *Squash mosaic virus* in Cucurbits Growing areas of Khorasan Razavi and Northern Khorasan Provinces

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Received:05-02-2011

Accepted:03-07-2012

Abstract

Melon veinbanding mosaic is characterized by formation of green vein banding in varieties of *Cucumis melo* L. The disease is caused by virus of about 30 nm diameter. During a survey in fall and summer of 2008 and 2009, out of 270 samples collected from cucurbit plants from different fields in Khorasan Razavi and Northern Khorasan provinces, 46 samples shown infection of SqMV by DAS-ELISA using specific polyclonal antibody (provided by Agdia company) . Based on host range and sampling location, eight ELISA positive samples were selected for further investigation and were inoculating under plants in greenhouse condition. Specific primers were designed to amplify a fragment (226bp) of SqMV protease gene by reverse transcription polymerase chain reaction (RT-PCR) using the total RNA extracted from SqMV infected samples. Amplified product was sequenced. Phylogenetic analysis with MEGA 4.1 by using 226 nucleotides sequence length of protease gene showed that Torbat-e-Jam isolate is very closed to Y-SqMV from Japan.

Keywords: Squash mosaic virus, Comovirus, RT-PCR

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Study of CUT1, Chi3 and CYP1 Genes Expression in Tomato Parasitized by Broomrape (*Orobanche aegyptica*)

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Received:19-01-2013

Accepted:20-04-2015

Abstract

Broomrape (*Orobanche aegyptica*) is an obligate root parasite causing yield losses in large number of crops such as tomato, sunflower, cucumber, tobacco. In tropical and Mediterranean countries from Europe, Africa and Asia. Several methods have been suggested for control of this parasite, but most of them are expensive and ineffective. For the efficient control, a better understanding of its interaction with host plant characterization of resistance mechanisms at molecular level is required, The expression of genes encoding chitinase, cysteine proteinase and sucrose transporter in response to *Orobanche aegyptica* was studied in a tolerant and sensitive tomatos cultivars by Realtime PCR method. Results showed that the genes were up-regulated in early stage of infection. Two species also showed different expression in sucrose transporter and cysteine proteinase, but the same expression was observed for chitinase gene. The behaviour pattern of two genotypes showed that defence activity of tomato started at early hours of infection and the resistant genotype responses were earlier than sensitive genotype to signal of invasion. Results also indicated that protease enzymes can be one of the important tools of plants for preventing the penetration and connection of parasite to its root.

Keywords: Broomrape, Chitinase, Cysteine proteinase, Sucrose transporter, Tomato

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The Study of Critical Period of Weed Control and Yield of Black Seed (*Nigella sativa* L.) Affected by Weed Free and Infested Periods

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Received: 28-05-2013

Accepted: 15-03-2015

Abstract

In order to determine the critical period of weed control (CPWC), yield and yield components of black seed (*Nigella sativa* L.) affected by weed competition and control periods, a field experiment was conducted based on randomized complete block design with 12 treatments and three replications at the Agricultural Research Station, Ferdowsi University of Mashhad, Iran in 2012. Two sets of weed-infested and weed-free treatments were employed in this study. At the first set of treatments, weeds were allowed to compete with black seed until 0, 14, 28, 42, 56 and 70 days after emergence (DAE) and then plots were kept free of weeds till harvesting. At the second ones, plots were kept free of weeds until the mentioned stages and then weeds were allowed to grow until harvesting. In this experiment, *Echinochloa crus-galli* L., *Amaranthus retroflexus* L. and *Chenopodium album* L. were the main dominant species, indicating by the highest leaf area index and dry matter. The results showed that leaf area index, number of follicle per plant, grain and oil yields of black seed were significantly affected by weed infestation and weed free periods. The results indicated that at 5 and 10% yield loss levels, onset of CPWC was 11 and 14 DAE (87 and 130 growing degree days (GDD)), respectively. Also, based on these levels of grain yield loss, the end of the CPWC were 64 and 57 DAE (922 and 783 GDD).

Keywords: Gampertz equation, Grain yield, Logistic equation, Oil yield, Yield loss

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Seasonal Population Fluctuations of the Diamondback Moth, *Plutella xylostella* (L.) (Lep.: Plutellidae) in Cauliflower Fields of the South of Tehran

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Received: 11-07-2013

Accepted: 10-12-2014

Abstract

The diamondback moth, *Plutella xylostella* (Linnaeus, 1758) (Lep.: Plutellidae) is the most destructive insect pest of crucifer plants throughout the world. In order to study its seasonal population fluctuation, sampling was conducted in the cauliflower fields of south of Tehran from late May until October 2011. One hectare cauliflower field in the middle of a large field was randomly selected in Jahan-abad, Kahrizak, Shokr-abad and Palayin regions. 600 m² fields in College of Agricultural Sciences, Shahed University, Tehran, Iran was selected, this field was not treated with insecticides. Each plant was presumed as a sampling unit and sample size was determined as 20 host plants. Sampling was carried out every 10 days and all eggs; larvae and pupa on the host plant were recorded. The peak of egg population (42.30 eggs per plant) was observed in all regions at October 25th. The highest density larval and pupal density were recorded 6.68 (larvae per plant) and 4.92 (pupa per plant), respectively in all regions at October 25th. The highest density of total stages was recorded in all regions at October 25th (53.90 insect per plant) and lowest density of total stages was seen at June 19th (4.86 insect per plant). The results showed that number of larval and pupal stages based on units density, between all experimental regions and Shahed university station had significant difference.

Keywords: Cauliflower, *Plutella xylostella*, Seasonal population fluctuation, Tehran

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Resistance of Wild mustard (*Sinapis arvensis*) and Turnipweed (*Rapistrum rugosum*) to Tribenuron-methyl Herbicide in Aq Qala

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Received: 25-07-2013

Accepted: 10-12-2014

Abstract

Over the past 20 years since tribenuron-methyl herbicide registration in Iran, reports of erratic control of broadleaf weeds with it have increased in wheat fields of Aq Qala. In order to evaluate the incidence of resistance in wild mustard (*Sinapis arvensis*) and turnipweed (*Rapistrum rugosum*) to tribenuron-methyl herbicide, dose-response assays were conducted during the years 1390 and 1391 at Gorgan University of Agricultural Science and Natural Resources. Wild mustard and turnipweed biotypes with suspected resistance to tribenuron-methyl herbicide were collected from wheat fields by moving on two hypothetical diameter of Aq Qala map. For each weed species, one susceptible biotype also collected from areas which had never been applied by herbicides. In these experiments, responses of sensitive and suspected resistance biotypes of both weeds were assayed by spraying the seedlings with different doses of tribenuron-methyl herbicide. Dose-response assays indicated resistance of wild mustard and turnipweed to tribenuron-methyl herbicide. Resistance factors of SRA₂ biotype of wild mustard and SRR₁ and SRR₂ biotypes of turnipweed to tribenuron-methyl herbicide were 4.05, 26.90 and 24.42, respectively. This is first report of resistance in wild mustard and turnipweed to tribenuron-methyl herbicides in the country. Distribution maps of infected fields to resistant wild mustard and turnipweed biotypes were processed using Geographic Information System. Results of this study could be used for running programs to manage resistant weeds and to prevent the development of resistant biotypes to other parts of the region.

Keywords: Distribution map, Dose - response, Resistant weeds

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Survey of Internal Infection of *Erwinia amylovora* in Symptomless Mother Apple Trees

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Received: 23-09-2013

Accepted: 24-01-2015

Abstract

The internal infections of *Erwinia amylovora* have important roles for disease beginning in the spring and dissemination of inoculum through infected vegetative planting material and nursery trees. In this study, we survey internal infection of *Erwinia amylovora* in symptomless commercial apple cultivars in Karaj and Damavand cities, using optimized diagnostic methods such as plating on semi selective medium, serological and molecular based assays. *E. amylovora* was not detected in Damavand samples but internal infection was detected in symptomless cultivars, Red rome, Janathan 3, Golab-e-Kohanz, in Karaj. Under favorable conditions, the primary infections that remain latent in the plants, start the disease cycle. Diagnosis of *Erwinia amylovora* in asymptomatic plant material of orchards and nurseries by certification programs could prevent development of fire blight disease.

Keywords: Apple cultivars, *Erwinia amylovora*, Internal infection

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Optimizing the Efficacy of Sulfosulfuron and Sulfosulfuron + Mesosulfuron-Methyl Herbicides to Control Wild Barley (*Hordeum spontaneum* Koch.) in Wheat With Adjuvants

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Received: 29-12-2013

Accepted: 30-06-2014

Abstract

Wild barley (*Hordeum spontaneum*) has invaded to wheat and barley fields since flamprop-isopropyl was obsolesced in Iran. The herbicides of sulfosulfuron and sulfosulfuron + metsulfuron-methyl are able to control it at higher-than-recommended dosages, causing a crop injury. Hence, two dose-response experiments in factorial experiment with a completely randomized design with four replications were conducted to enhance the efficacy of them by adding 9 adjuvants in faculty of agriculture, Ferdowsi University of Mashhad, Iran in 2013. The treatments included six doses of each herbicide with and without each adjuvant. Moreover, a cultivar of wheat (Gaskogen) was treated by the doses of both herbicides with and without each vegetable oil, the ED90s, to check selectivity. According to relative potency values, Adigor and Propel were the most effective adjuvant to enhance the efficacy of sulfosulfuron and sulfosulfuron + metsulfuron-methyl, respectively. In contrast, Ammonium Nitrate and D-Octil were the least effective adjuvant to enhance the efficacy of sulfosulfuron and sulfosulfuron + metsulfuron-methyl, respectively. Selectivity of both herbicides was not changed by applying adjuvants. Whereas penetrate agents had the greatest efficiency among the adjuvants can be stated that probably relative tolerance of wild barley, in addition to herbicide degradation, is due to physicochemical properties of the leaf cuticle.

Keywords: Adjuvant, Efficiency, Herbicide, Selectivity, Wheat, Wild barley

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Molecular and Phylogenetic Analysis of *Polymyxa betae* Keskin, Isolated from Sugar Beet Fields in Razavi and Northern Khorasan Provinces by ITS Sequence Analysis

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Received: 26-01-2014

Accepted: 18-05-2014

Abstract

For study the genetic diversity and Phylogenetic analysis of *Polymyxa betae* Keskin, isolated from sugar beet fields in Razavi and Northern Khorasan provinces, soil of 49 fields were sampled and sugar beet seeds (variety IC) were planted that. After DNA extraction, a genomic region comprises of 463 bp of *P. betae* isolation including 18s rRNA, ITS1, 5.8srRNA, ITS2 and 28s rRNA was amplified using Pxd1 /ITS4 primers. The 22 isolates were selected and sequenced. According to our results, the fungal isolates grouped in two distinct clades. Isolates belonging to Razavi and Northern Khorasan provinces were clustered in one group with high similarity, separated from European group. Consequently our data indicated that the ITS2 region is more proper to analyse genetic variation among the *P. betae* isolates than ITS1 region.

Keywords: Genetic diversity, Khorasan Razavi Province, Northern Khorasan Province, Phylogenetic analysis, *Polymyxa betae*

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Molecular Identification of *Turnip Mosaic virus* (TuMV) in Hoary Mustard (*Hirschfeldia incana*) From Iran

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Received: 27-01-2014

Accepted: 19-05-2014

Abstract

Turnip mosaic virus (TuMV) is a member of the *Potyvirus* genus within the *Potyviridae* family and is one of the most important viruses infecting Brassicaceae plants. In April 2012, suspicious symptoms of a viral disease such as mosaic, stunting and malformation were observed on *Hirschfeldia incana*. The collected samples were tested using reverse transcription-polymerase chain reaction (RT-PCR) with specific primers corresponding to TuMV coat protein gene. Amplified fragment (986bp) was first purified and then directly sequenced. Analysis of its CP nucleotide and amino acid sequence revealed 85.42-89.58 % and 91.64-95.12% similarity to those of 31 TuMV isolates from other countries respectively. Phylogenetic tree was constructed by MEGA6 software using neighbor joining method. The results showed that the TuMV isolate and 3 Iranian isolates have been clustered into the basal-B group.

Keywords: *Hirschfeldia incana* (L.) Lagr.-Foss., Molecular identification, Phylogenetic analysis, *Turnip mosaic virus* (TuMV)

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Susceptibility of Colorado Potato Beetle, *Leptinotarsa decemlineata* (Say) (Col: Chrysomelidae), to Essential Oil and Main Components of Some Medicinal Plants

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Received: 08-04-2014

Accepted: 01-02-2015

Abstract

Colorado potato beetle, *Leptinotarsa decemlineata* (Say), is one of the most important pests of potato in Iran and Worlds. For controlling this pest chemical pesticides have used more that have happened pollution of environment and resistance varieties. In this way, using plant materials is one of promising method for controlling this pest. In this study, essential oils of six plant species including: *Satureja khuzistanica* Jamzad, *Ocimum basilicum* L., *Thymus daenensis* Celak., *Myrtus communis* L., *Mentha spicata* L. and *Eugenia caryophyllus* (Sprengel) and two monoterpenes (carvacrol and thymol) were investigated against first, second and third instars larvae and oviposition deterrence of *L. decemlineata* at $25\pm 1^{\circ}\text{C}$, $65\pm 5\%$ RH in 16:8 conditions. Result showed that when increased larval stages the effect of essential oils decreased and essential oil of *S. khuzistanica* and carvacrol its main component had highest effect on larval stages of Colorado potato beetle. Also, essential oil of *S. khuzistanica* had highest and *O. basilicum* had lowest effect on oviposition deterrence. So, essential oil of *S. khuzistanica* and carvacrol because of their satisfied insecticides could be used in control management of *L. decemlineata* for elimination of chemical toxin.

Keywords: Medicinal plants, *Leptinotarsa decemlineata*, Oviposition deterrence

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Effect of Soil Solarization on Common Lambsquarters (*Chenopodium album* L.) Control in Birjand Region

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Received: 22-04-2014

Accepted: 24-01-2015

Abstract

To evaluate the effect of soil solarization on common lambsquarters control (*chenopodium album* L.), an experiment was conducted at the research farm of college of agriculture, University of Birjand. The factorial experiment was performed as a randomized complete block design with three factors including the number of clear plastic layers (uncovered as the control, 1-layer and 2-layer plastic sheets), duration of coverage (15, 30 and 45 days) and seed burial depth (0, 5, 10 and 15 cm) with three replications. The seed samples alternatively pulled out of different depths of soil and were transported to the research laboratory. The seeds which were germinated in the field were counted, then the rest of the seeds after preparation were tested in the research laboratory in the germinator. During the germination period, some traits such as; germination rate, length of shoot and radicle, percentage of decayed germinated seeds were measured in the laboratory. Results showed that, solarization significantly increased soil temperature (as much as 6.3 to 15.1 ° C) compared to the control. Maximum percentage decayed seeds were at two-layer plastic. The percentage of decayed seeds increased by increasing of solarization duration and it decreased by increasing of burial depths. As a whole, solarization reduced the common lambsquarters seed germinability and ultimately led to an effective control of this weed species. According to the results of this research, it appears that solarization can be used as a nonchemical method for common lambsquarters control especially in arid regions of the country.

Keywords: Germination, Mulch, Nonchemical weed control, Seed decay

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Identification Key and Introduction of New Species of Order Symphypleona (Collembola, Hexapoda)

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Received: 03-06-2014

Accepted: 10-12-2014

Abstract

The Symphypleona fauna of Mazandaran province was studied in 2013. The specimens were extracted by Berlese funnel from soil, leaf litter and dead woods and identified after preparing microscopic slides. In present study, the specimens are belonging to the families, Sminthuridae and Katiannidae. Among the species of Katiannidae, *Sminthurinus gisini* Gama, 1965 is recorded for the first time from Iran and *S. elegans* Fitch, 1863 is new for Noor region. Family Sminthuridae is reported for the first time from Mazandaran province. The genus *Sphaeridia* Linnaniemi, 1912 and species *S. pumilis* (Krausbauer, 1898) belonging to this family are new for Mazandaran province. An identification key for the families, genera and species of order Symphypleona which have been reported from Iran is presented in this study.

Keywords: Collembola, Identification key, Mazandaran province, Symphypleona

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The Broomrape (*Orobanche aegyptiaca*) Integrated Suppression in Tomato (*Solanum lycopersicum* L.) by Ammonium Sulfate Fertilization and Glyphosate Herbicide

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Received: 09-06-2014

Accepted: 17-02-2015

Abstract

The interaction between nitrogen levels: 100, 150 and 175 kg ha⁻¹, as ammonium sulfate (AMS 21%) and glyphosate (SL 41%): 1) 61.5 gr a.i. ha⁻¹ sprayed in three parts, 30, 40 and 50 DAP, 2) 61.5 gr a.i. ha⁻¹ sprayed in two parts, 30 and 50 DAP, 3) 86 gr a.i. ha⁻¹ sprayed in three parts as level one, and 4) 86 gr a.i. ha⁻¹ sprayed in two parts as level two on broomrape shoot density and dry mater and tomato yields was studied in a factorial design with 4 replication. Broomrape inhibition increased with increasing amount of AMS. Glyphosate as a synergistic factor improved the effect of AMS on broomrape suppression (up to 89% reduction in shoots and 72% reduction in dry weight of broomrape). Three time split dose of glyphosate was more successful in broomrape control than two time split dose because of parasite longer exposure to herbicide. Response of tomato to N fertilization was positive up to 150 kg ha⁻¹ of N and more than that, despite the severe repression of broomrape, the tomato yield decreased up to 45.5%. Glyphosate treatments caused no lasting toxicity in tomato (based on visual assessment) were indirect effect of glyphosate on tomato was induced by broomrape suppression. Finally, 150 kg ha⁻¹ of N as AMS together with application of 86 gr a.i. ha⁻¹ of glyphosate as splitted three times, could be recommended as the preferred treatment of this study as produced 43 ton ha⁻¹ of tomato and reduced 75% in broomrape shoot numbers.

Keywords: Herbicide, Interaction, Nitrogen fertilization, Parasitic plant

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Identification of the Causal agent of Blackleg and Soft rot of Potato in Ardabil Province

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Received: 14-06-2014

Accepted: 24-01-2015

Abstract

In order to characterize blackleg and soft rot agent of potato in Ardabil province, samples showing mentioned symptoms were gathered from fields and storages during 2012 and 53 pectolytic isolates were obtained in primary purification. After confirming their pathogenicity, phenotypic features were investigated and compared to those of the reference strains. Rotting severity of isolates and infection percentage were determined in each region. Based on differential phenotypic tests related to enterobacteriaceae, the high variation was shown among isolates and all tested strains divided to six groups. According to our data, isolates belonged to first and second group resembled *Pectobacterium carotovorum* subsp. *carotovorum* and *P. wasabiae*, respectively. The third group was similar to *P. atrosepticum* and the fourth group formed a separate group with *Dickeya chrysanthemi*. These results were confirmed by molecular assays. Some isolates related to fifth group showed intermediate features between *Pcc* and *Dch*. The sixth group was included just one isolate and based on the phenotypic characteristics was similar to both *Pcc* and *Pw*. Among sampling regions in Ardabil, Kalkhoran with 18.75 % infection, showed the highest rate of contamination to pectolytic bacteria.

Keywords: Ardabil, *Dickeya*, Identification, Soft rot, *Pectobacterium*, Potato

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Investigations on the Cardinal Temperatures for Germination of *Alhaji pseudalhagi*

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Received: 16-11-2014

Accepted: 01-02-2015

Abstract

In order to evaluate the characteristics of germination and early growth of weed seed germination and determine the cardinal temperatures camel's thorn, Tests on the weed seed biotype *Alhaji pseudalhagi*, at constant temperatures of 5, 8, 10, 15, 20, 25, 30, 35, 40, 45 and 50 ° C in a completely randomized design-in of 1391 in Weed Research Laboratory, College Agriculture, Ferdowsi University of Mashhad were considered. For each Thermal treatment, four replicates of 25 seeds were used For any thermal treatment , The characteristics such as percentage of seed germination, rate of seed germination, the time of reaching 50% seed germination were recorded. In order to select best estimate of germination criteria based on three regression models namely: Five-parameters Beta(FPB), Intersected-lines(ISL) and Quadratic Polynomial (QPN) models. The effect of temperature on rate and percentage of germination was significant. The highest germination percentage(GP) range was 20-35°C while the highest germination rate(GR) occurred at 25°C. Best model fit over the entire temperature range was obtained by FPB model. Based on the regression between germination rate and temperature in biotype, the cardinal temperatures (Tbase, Topt and Tmax) were: (7.2-8.8), (27.5-30.6) and (42-50.5) °C, respectively.

Keywords: *Alhaji pseudalhagi*, Cardinal temperatures, Germination percentage and rate, Regression models

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Brief report First Report of *Verticillium epiphytum* on *Thrips tabaci* from Iran

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Received: 11-03-2014

Accepted: 06-01-2015

Abstract

The entomopathogenic fungus, *Verticillium epiphytum* was isolated from the infected specimens of *Thrips tabaci* collected in Mashhad in April 2011. The fungus has been previously reported from rusts and sugar beet cyst nematode *Heterodera schachtii*. This is the first record of *V. epiphytum* on *T. tabaci* in the world.

Keywords: Entomopathogenic fungus, Thrips, *Verticillium epiphytum*

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