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Serological and Molecular identification of *Zucchini yellow mosaic virus* in Khorasan Razavi province

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Abstract

Zucchini yellow mosaic virus (ZYMV) causes high yield losses to cucurbits in many parts of the world. During a survey in summer and fall of 2008 and 2009, 392 collected from different fields in Khorasan Razavi, Northern Khorasan and Southern Khorasan provinces were tested based on DAS-ELISA tests using ZYMV specific polyclonal antibody. The result showed that 72 out of 392 samples were infected by ZYMV. Subsequently two ELISA positive samples were selected based on host range and sampling location for further investigation using specific primers for ZYMV coat protein gene. A fragment (970bp) was amplified in reverse transcription polymerase chain reaction (RT-PCR) using total RNA of plants infected with isolates of ZYMV(P03,Da). Phylogenetic analysis showed that Neyshabour(Po3) and Dargaz (Da) isolate were very close up to 94% identity in cp gene to SYZY-30 isolate from Syria.

Keywords: ZYMV, DAS-ELISA, Polymerase Chain Reaction, Phylogenetic analysis

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Detection of *Cauliflower mosaic virus* by Serological and Molecular Methods in Northern and Razavi Khorasan Provinces of Iran

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Accepted: 02-06-2013

Abstract

Cauliflower mosaic virus is a type member of *Caulimovirus* from *Caulimoviridae* family that has double stranded DNA genome and is one of the most destructive viruses of cruciferous plants. In order to detect *cauliflower mosaic virus* in some areas of Iran under the cultivation of cauliflower, 343 symptomatic leaf samples of cauliflower were collected from Northern and Razavi Khorasan provinces of Iran in summer 2009-2010.To detect CaMV infection, collected plants were tested by DAS-ELISA. Polymerase chain reaction (PCR) using CaMV-specific primers (CMcp-F1\CMcp-R1) for ORF IV genes of CaMV was used for confirmation of infection. A 1400 bp fragment were amplified by PCR and then sequenced. Iranian isolates were compared with other isolates of CaMV deposited in the gene bank. The phylogenic trees of the coat protein genes of CaMV were drown by MEGA5 software using neighbor joining method. The results showed that the Iranian isolates clustered with Chinese and Hungarian isolates in a different clade from North- American isolates.

Keywords: *Cauliflower mosaic virus*, Coat protein, DAS-ELISA, PCR

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جلد ۲۹، شماره ۱، بهار ۱۳۹۴، ص. ۳

Determination of Cardinal Temperatures in the Seeds of Henbane, Aconite and Hemp

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Received: 27-05-2013
Accepted: 04-01-2015

Abstract

In order to study the cardinal temperatures of three weeds henbane (*Hyoscyamus niger* L), Aconite (*Aconitum napellusl* L.) and Hemp (*Cannabis sativa* L.) at seven levels of temperatures (5, 10, 15, 20, 25, 30 and 35 °C), an experiment was carried out in completely randomized design with 3 replications and factorial experimental arrangement in Weeds Research Laboratory, Faculty of Agriculture, Ferdowsi University of Mashhad in 2012. Results showed that the seeds of henbane, Aconite and Hemp had the maximum germination percentage at 20 °C. The response of these weeds to temperatures higher than 20 °C was different. Hyoscyamus plant had lower germination percentage at 10 °C in compare with two others plants. The highest seedling and rootlet length in Hemp, henbane and Aconite were observed at 20 and 15 °C, 30 and 20 °C, 20 and 25 °C respectively. The cardinal temperatures including base temperature (Tb), optimum temperature (To) and ceiling temperature (Tc) for henbane was 0.66, 31 and 41 and for Aconite 2.84, 11.48 and 41.05 and for Hemp 2.6, 26.8 and 42.8 °C, respectively. On the whole, results of this experiment showed that there is a wide range of temperatures on germination and emergence of weed for their emergence and establishment.

Keywords: Cardinal temperature, Germination percentage, Length of seedling, Length of rootlet

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جلد ۲۹، شماره ۱، بهار ۱۳۹۴، ص. ۴

Investigation of Pathogenisity and Genotypic Diversity of *Xanthomonas oryzae* pv. *oryzae* Caused Rice Bacterial Blight

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Accepted: 21-01-2015

Abstract

To investigation of pathogenisity and genotype diversity of *Xanthomonas oryzae* pv. *oryzae* (*Xoo*) caused rice bacterial blight, several samples were collected from paddy field of rice in Rasht-sangar, Soumeh sara, Rezvan shahr, Daboudasht amol and Rice-Institute-Research guilan during the summer of 2012, from plants that showed blight and yellowing in their leaves. Bacterial isolates were identified according to phenotypic and molecular characteristics. Among isolated bacterial strains 17 isolates were selected for further investigations. Isolates grouped into three pathogenisity groups based on virulence against susceptible international rice cultivar Tetep. The genetic diversity of 17 isolates analyzed by using Repetative extragenomic polymorphism (REP-PCR). Cluster analysis based on 33 polymorphic REP markers showed three different genotypic groups among isolates with at least 62% similarity. The results showed limit correlation between different Pathogenisity and genotypic groups of *X.oryzae* pv. *oryzae.*

Keywords*:* Rice, *Xanthomonas oryzae* pv. *oryzae* (*Xoo*), Pathogenisity, Genotyping

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جلد ۲۹، شماره ۱، بهار ۱۳۹۴، ص. ۵

Investigation of the Effects of Clodinafop and Dicamba+2, 4-D on Kautskey Curve and Chlorophyll Fluorescence.

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Received: 30-07-2012
Accepted: 03-11-2012

Abstract

Measurement of chlorophyll fluorescence is noninvasive, highly sensitive, fast and easy way to give important information about the photosynthetic apparatus. Chlorophyll fluorescence parameters and Kautsky curves of wild oat and wild mustard sprayed by clodinafop and Dicamba+2, 4-D respectively was investigated at two green house experiments. The results indicated significant reduction at trend of F_v/F_m ،F_{vj} and Area parameters five days after clodinafop spraying. The shapes of the Kautsky curves were affected by clodinafop five days after spraying. The maximum fluorescence (F_m) reduced significantly At 5 days after spraying. Chlorophyll fluorescence parameters revealed clodinafop efficiency one week before herbicide symptoms occurred. Chlorophyll fluorescence could be an alternative method to study herbicide efficacy compare to the classical method (measuring dry or fresh weight). At wild mustard the shape of the Kautsky curve at higher doses of Dicamba+2, 4-D (371.2 and 165.1 g ai./ha) was affected one day after spray. The Kautsky curve quenching after 1000 ms did not occur two days after spray at the recommended dose (371.2 g ai./ha) but its decay was observed at under recommended doses at both one and two days after spray. Finally although clodinafop and Dicamba+2, 4-D are not directly PSII inhibitor but they could change the Kautsky curves shape and form before revealing visual symptoms of these herbicides.

Keywords: F_v/F_m, F_{vj}, Area, Dark adapted leaves

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The First Report of Six Species and Genus of Torymidae Family (Hym: Chalcidoidea) from Iran

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Received: 24-08-2013
Accepted: 24-12-2014

Abstract

Torymidae is one of the largest families of parasitoid waps. During this study which is conducted during 2010-2012, 14 species of the family Torymidae (Hym.: Chalcidoidea) were collected from Kurdistan Province, of which, one genus and six species were new records for Iranian fauna. The genus *Torymoides* Walker is new record for Iranian torymid fauna. New records were listed. *Microdontomerus albipes* (Giraud), *Pseudotorymus leguminus* Ruschka, *P. salviae* Ruschka, *P. sapphyrinus* (Fonscolombe), *Podagrion minus* Strand, and *Torymoides dispar* (Masi).

Keywords: Parasitoid, Torymidae, Kurdistan, Biological control

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Identification and Molecular Analysis of *Beet yellows virus* (BYV) in Khorasan Razavi Province

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Accepted: 10-12-2014

Abstract

Beet yellows virus belong to the genus *Closterovirus* in the *Closteroviridae* family which is one the most important viruses of sugar beet worldwide. In order to identify and characterize some molecular aspects of the BYV, 48 symptomatic leaf samples of sugar beet were collected from sugar beet field in Khorasan Razavi province of Iran. Leaves showing general yellowing, vein clearing and thickness were collected. In order to detect the BYV in symptomatic samples RT-PCR reactions were done. Coat protein of several BYV symptomatic samples was amplified by RT-PCR. An amplification of the expected size of 615 bp for BYV coat protein was obtained in these samples and then one of them sequenced. This sequence data was aligned with other reported BYV using the BLAST and then analyzed with the aid of the DNAMAN Version 7 software. It showed that this sequence covered the CP coding region of BYV, and shared the highest nucleotide (94.79%) and amino acid (90.59%) identity with an Ukrainian isolate (X73476). Phylogenetic analyses were conducted with the Clustal W method and visualized with MEGA (Vers. 5.2). The results of phylogenetic analysis were consistent with the sequence comparison results.

Keywords: *Beet yellows virus,* Sugar beet, Khorasan Razavi, Iran

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جلد ۲۹، شماره ۱، بهار ۱۳۹۴، ص. ۸

Effect of Sublethal Concentrations of Chlorothalonil on Weight Variations and Bioenergetic Resources of Colorado potato beetle *Leptinotarsa decemlineata* Say (Col.: Chrysomelidae)

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Abstract

The Colorado potato beetle (CPB) is the most important pest of potato. Adults and larvae feeding on potato leaves cause economically damage to host. Since this pest overwinters as adults in soil, any disturbance in assimilation and storage of the energy resources may weaken the overwintering adults and lessen their resistance to environmental stresses during the winter. In this research, effects of sublethal concentrations of Chlorothalonil 72% SC were studied on lipid, carbohydrate and protein contents in CPB adults under field conditions. The experiments had a complete randomized four-factor factorial design. The four factors were the concentration (0, 2000, 3000 and 4000 µl/l), sex (male and female), time (3, 6 and 12 day) and number of treatment (first and second). The sugar, glycogen and lipid quantities were determined in milligram per gram of fresh weight. Results showed that Chlorothalonil affected significantly the lipids, glycogens, sugars, proteins and caloric content ($p<0.01$). The most reductions in bioenergetic resources were observed in adults retreated with the concentration of 3000 µl/l 12 days after second Spraying. After taking into account the control, %61.07, %21.58, %57.22 and %54.46 reduction were found in lipid, glycogen, sugar and energy content, respectively. Also in concentration of 3000 µl/l protein increased as much as 39.94%. So the chlorthalonil reduced the outcome of energy in CPB.

Keywords: Fungicide, Pesticide, Lipids, Carbohydrates, Proteins, Caloric content

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جلد ۲۹، شماره ۱، بهار ۱۳۹۴، ص. ۹

Effect of Temperature on Germination and Cardinal Temperatures for Upper d and Lower Set up Seeds of *(Rapistrum rugosum*.)

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Received:19-12-2013
Accepted:10-12-2014

Abstract

In order to determine cardinal temperatures and some germination characteristics for type one seed (upper segment) and type two seed (lower segment) of *Rapistrum rugosum*, an experiment was conducted on two type seed and10 levels of temperatures (3, 5, 10, 15, 20, 25, 30, 35, 40 and 45 °C) in completely randomized design with four replications in factorial experimental arrangement in Weeds Research Laboratory, Faculty of Agriculture, Ferdowsi University of Mashhad in 2012. Results indicated that the cardinal temperatures for type one seed (Min, Opt and Max) were 0.7, 35.8 and 45.4C° and for type two seed were 1.3, 31.7 and 48.5, respectively. The highest germination percentage for type one seed (upper segment) was in temperature range 10-35°C and for type two (lower segment) was in 5-35°C. Germination percentage in type two seed (81%) was more than type one (41%). There was significant different between length of plumule and radical of type one and two seed in 10°C ($P \leq 0.05$). As length of plumule and radical of type one was more than type two seed.

Keywords: Rapistrum, Seed, Temperature, Germination

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Spatiotemporal Variations in Biodiversity Indices of Hover Flies (Dip.: Syrphidae) in Some Agroecosystems in Kerman Province

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Abstract

Pollination and pest control are perhaps the best-known ecological services performed by hover flies. The species diversity and their abundance have an influential impact on the ecological services provided by this family. To find out species diversity of adult flower flies associated with agroecosystems in Kerman province, a biodiversity survey using insect net and color water traps was conducted in years 2012 and 2013. Using 3 types of color water trap biodiversity indices of flower flies at 3 different sampling sites were evaluated. At each sampling site, from each color of yellow, blue and white 3 traps were placed on stands and the captured flies were collected every 2 weeks from late April until late July in 2 sequential years. The values of biodiversity indices were determined both in time and spatial scales. In this study, 29 species belonging to 2 subfamilies were collected and identified which all of them were new for the fauna of Kerman province. Among them, *Paragus romanicus* Stanescu is reported from Iran for the first time. A two-way ANOVA revealed that the measured values for Shannon-Weiner index had significant differences only in time. The differences in evenness values in time scale for year 2012 were not significant, but in 2013, the evenness values had significant differences in both time and location of sampling. The results showed considerable differences in efficiency of collection methods used in the present study.

Keywords: Species diversity, Flower flies, Shannon-Weiner index, Biodiversity

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جلد ۲۹، شماره ۱، بهار ۱۳۹۴، ص. ۱۱

Effect of Nitrogen on Weed Tolerance and Competition indices of Five Wheat Cultivars to Weeds competition

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Abstract

Breeding and cropping cultivars with high weed competitiveness have played an important role in the non-chemical weed management. This experiment was carried out in order to study the effect of nitrogen on weed tolerance and competition indices of five wheat cultivars at the research field of agricultural faculty, University of Mohaghegh Ardabili, during 2010-2011 growing season. Experimental factors were three nitrogen rates (0, 75 and 150 kg ha^{-1}) and five wheat cultivars (Kasgozhen, Sieson, Gaspard, Azar2 and MV-17) which grown under weedy and weed free conditions. Results showed that cultivar and nitrogen had a significant effect on stress tolerance index (TOL index). The lowest TOL was observed in MV-17 cultivar. Application of 150 kg N ha^{-1} increased TOL index nearly two times. Results also showed that three tolerance indices Weed interference tolerance index (WITI), mean productivity (MP) and Harmonic (HARM) had a same trend and these indices increased by increasing nitrogen rate in Kasgozhen, Sieson and Gaspard cultivars. In contrary, these indices were reduced by increasing nitrogen in MV-17 cultivar. Results showed that competitive index (CI) had a significant difference with tolerance indices. By increasing nitrogen rate CI decreased from 2.5 to 0.5 in Azar2 cultivar. Findings of this experiment indicate that weed tolerance and competitive ability of wheat cultivars are different and can be used for IWM at sustainable agriculture.

Keywords: Integrated weed management, Sustainable agriculture, Tolerance and competitive indices, wheat cultivar

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The Effect of Different Weeds Control and Tillage Systems on Cotton's Weeds Manangment in Second Planting After of Winter Wheat

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Abstract

To evaluate the effect of combined use of weeds control an different mechanical methods on weeds number and dry weight in cotton , a split plot experiment based on randomized complete block design was conducted at the region of Boshruyeh in 2012. Experimentals factors were tillage methods as Main-plots with three levels, including conventional tillage, no-till system and minimum tillage; and different methods of weed control at 5 levels (trifloxysulfuron sodium at 10, 15 and 20 g ha^{-1}, as well as no weeding and hand hoeing) as sub-plots with four replications. The results showed that there were significant differences between different methods of weeds control on weed number and weight of narrowleaf weeds and broadleaf weeds. The highest decreased of narrow leaf and broadleaf weed number was related to hand hoeing treatment with 99/02 and 72/75 %. The highest decreased narrow leaf and broadleaf weed numbers was shown in 20 mg ha-1 envok with adjuvant treatment with 54/98 and 53/51% after hand hoeing treatment. The highest decreased broadleaf and narrow leaf weeds weight was hand hoeing treatment 70% And 48/95%. The results showed that by adopting an appropriate concentration of herbicide envok with adjuant and preparation of seed bed can be to a great extent reduced weed farm.

Keywords: No tillage, Minimum tillage, Conventional tillage, Envoke

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جلد ۲۹، شماره ۱، بهار ۱۳۹۴، ص. ۱۳

Comparison of Metribuzin and Non-living Mulches Efficiencyon Weed Control and Total Yield of Tomato (*Lycopersicom escolentum* cv. CH)

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Abstract

The current study, was designed in a randomized complete block with three replications in College of Agriculture, Shiraz University in 2012, to compare the effects of 6 types of non-living mulch (clear plastic, black plastic, wheat straw, sawdust, coco peat and peat moss) with metribuzin on weed control, total yield and marketable yield of tomato cv "CH". The results showed that there is no significant difference between wheat straw mulch and cocopeat with mtribuzin on tomato yield. In addition, plots treated with black plastic mulch and sawdust respectively had the highest (20.93 kg/m^2) and the lowest (3.40 kg/m^2) tomato yield. Clear plastic mulch and wheat straw showed 7.66and 62.33 weeds per unit are a which respectively had the highest and the lowest efficiency on weed control. While among all of mulch treatment, only the clear plastic mulch had no significant difference with mtribuzin on weed density per unit area. So, according to the results, clear and black plastic mulches had more positive impacts on weed control and yield of tomato than metribuzin and the other mulches.

Keywords: Mulch, Herbicide, Tomato, Weed control

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A Study on Faunestic, and Biodiversity and Population Dynamics of Edaphic Millipedes (Diplopoda) during Different Seasons in Semeskandeh Forests, Mazandaran Province, Iran

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Abstract

The present study was carried out during a one year period in 2012-2013 in order to investigation of seasonal density and diversity of Diplopoda in a Hyrcanian forest (Semeskandeh forest) in northern Iran. For these purpose, some forest soil sampling were done in two mounth intervals and the samples were collected from leaf litter ($O_{L,F,H}$), the 0-3 cm and 3-6 cm of soil layer (A_h). A total of 7 species belong to 3 order, 5 family and 6 genera were collected and identified from Semeskandeh forest. In this study two species (*Leptoiulus* sp. nov. and *Amblyiulus* sp. nov.) be found for the first time for the fauna of the world. *Leptoiulus* sp. nov. are the most abundant species and *Cylindroiulus treptoflagellum* (Read, 1992) are less dominant. The highest abundance of Diplopoda was observed in leaf litter and 0-3 cm in summer. Also abundance of Diplopoda was low in deep layer of soil (3-6 cm) in Spring. Additionally, diversity of Diplopoda indicated that species diversity was highest in Autumn in leaf litter and there was low species diversity in Winter in deep layer of soil. In total, species diversity and population density of Diplopoda in leaf litter was higher than deeper layers (3-6 cm) of soil. According to this study, Diplopoda are potentially one of the main factors in food chain in Hyrcanian forests and our results show the importance of biodiversity conservation and management of natural resources of this area.

Keywords: Diplopoda, Diversity, Fauna, Hyrcanian forest, Mazandaran

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جلد ۲۹، شماره ۱، بهار ۱۳۹۴، ص. ۱۵

Survey on Chitinase Production by Several Isolates of *Trichoderama* and its Biological Control effect on Tomato Root-knot Nematode *Meloidogyne javanica*

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Abstract

Chitin is one of the most important compounds of true fungi cell wall. This compound is used greatly in structural of nematodes egg shell including *Meloidogyne javanica*. After chitin dissection by chitinase enzyme, convert to its sub units N-Acetyl Glucosamine. Species of *Trichoderama* genus due to high levels production of many hydrolytic enzymes including Chitinase, Protease and B-1,3-Glucanases, is used as a biocontrol agent of plant pathogens. In the current study, chitinase activity levels of 15 isolates of *Trichoderama* spp. was investigated to their biocontrol effects on tomato root knot nematode. Among this 15 isolates, T.BI, T6 and T65 respectively with 19.2, 18.3 and 17 U/ml enzyme activity were known as the most active isolates. Also T16, T12N and T12 respectively with 5.5, 5.4 and 3.7 U/ml enzyme activity were known as the weakest isolates. These results was in agreement with the results of greenhouse experiments and T.BI, T65 and T6 isolates were reported as the highest effective in biological control of *m.javanica*.

Keywords: *Trichodema*, Biological control, Enzyme Activity, Tomato root-knot nematode

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نشریه حفاظت گیاهان (علوم و صنایع کشاورزی)
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Study of Allelopatic Mechanism of *Ferula flabelliloba* Aquatic Extract in Germinating *Alyssum szivitsianum* Seeds

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Abstract

Some reports indicated that terpenoides allochemicals material induced oxidative stresses during seed germination phase. α-pinnen, as one of important allechemical monoterpenoids, reported from species of several plant family and especially *Ferula flabelliloba* from Apiaceae. In order to investigate the allelopatic effect of *F. flabelliloba* and the time of sampling on physiological and biochemical processes during seed germination of *A. szivitsianum* a factorial experiment was conducted in a completely randomized design with four replication. The first factor was allelopatic materials in three levels including 10% leaf aquatic extract of *F. flabelliloba* (gathered in vegetative period), 5 mg L^{-1} α-pinnen and control and the second factor was time of sampling in 5 levels including sampling in 24,48,72,96 and 120 hour after imbibitions. Results showed that, both leaf aquatic extract of *F. flabelliloba* and α-pinnen solution decreased *A. szivitsianum* seed germination and viability. The velocity of seed losses viability was faster in the seeds exposed in plant extract. The amount of solute leakage, hydrogen peroxide and malondialdehyde increased in seeds treated with allelochemical materials. In addition, the activities of the antioxidative enzymes of superoxide dismutase (SOD), catalase (CAT), ascorbare peroxidase (APX) and glutathione reductase affected by allelochemicals and time of sampling. The highest activities of antioxidative enzymes and H_2O_2 concentration were measured in seeds that germinated under plant water extract and sampled after 120 hours. My results demonstrated that despite the activation of antioxidant system by *F. flabelliloba* phytotoxin and α-pinnen, reactive oxygen species accumulation caused cellular damage, which resulted in the decrease of seed viability. It seems that the increased level of scavenging enzymes indicated their induction as a defence mechanism in response to allelochemicals.

Keywords: Electrolyte leakage, Enzyme, Germination, Lipid peroxidation, Oxidative stress

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Canola (*Brassica napus* L.) - Weeds Interaction Under Different Weeding Time

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Abstract

In order to evaluate the impact of time of weed control on yield and yield components of two rapeseed cultivars (Zarfam and Opra) two separate experiments based on each cultivar conducted at Shahryar (Karaj). The experiment was carried out based on RCBD with three replications and six treatments for each cultivar. Treatments were exerted on the different phenological growth stages including the emergence of 4th and 8th leaf, branching, flowering as well as weed-free and weed-infested stages in whole plant growth cycle. In current study some weed species including wild mustard (*Sinapis arvensis* L.), wild oats (*Avena ludoviciana* Dur.), lambsquarter (*Chenopodium album* L.), and Hoary cress (*Cardaria draba (L.)* Desv.) were selected as main weed species based on their higher dry matter. In both cultivares extended weed interference resulted in increased weed total dry matter. weed interference in four-leafed, eight-leafed, branching, flowering, weed- free and total infestation sages in comparison with weed-free period led to 20 ،33 ،38 ،50 and 55 percent reduction in grain yield respectively in Zarfam cultivar whilst these figures were about 14, 25, 29, 48 and 56 percent in Opra cultivar respectively. The results of mean comparisons revealed that in weed-free treatment, the highest number of sub-branches were 8 and 5/33 in both Zarfam and Opra respectively. Among the weed-interference treatments the highest number of pods in Zarfam cultivar was achieved at the four-leafed stage with 133 pods per plant but in Opra cultivar the four-leafed, eight-leafed and branching stages have the highest number of pod per plant as 67/110, 67/109 and 33/108 receptively, which proved no significant difference. In both Zarfam and Opra varieties the highest number of grain per pod was observed in weed-free treatments which was equals to 26.67 and 21.33, respectively.

Keywords: Competition, Yield, Rapeseed, Weed control

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Brief report
Detection of Viruses Causing Mosaic on Tomato in Fields and Greenhouses of Yazd and strain Determination of Some Tomato Isolates of *Potato virus Y* (PVY)

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Abstract

Tomato is one of the most important vegetables in Iran and throughout the world with crop loss caused by several viruses. This survey was carried out to detect the viruses causing mosaic symptoms on tomato in Yazd city (Iran). A total of 451 samples of tomato leaves showing mosaic symptoms were collected from fields and greenhouses during 2012-2013 growing season. Collected samples were analyzed by DAS-ELISA and ACP-ELISA using *Tobacco mosaic virus* (TMV), *Cucumber mosaic virus* (CMV), *Arabis mosaic virus* (ArMV) and *Potato virus Y* (PVY) and *Potyvirus* genus specific antisera, resulted in positive reaction of 13.5%, 11.3%, 2.6%, 20.6% and 14.5% of symptomatic samples, respectively. According to these results, PVY was determined as the dominant virus among collected samples. To determine the strain of four PVY isolates, a fragment with 837 bp in length of the PVY P1 gene was amplified using P1/P2 primer pair by RT-PCR. Restriction analysis of P1 PCR product using *HincII* was conducted and two fragments with approximately 400 bp length were produced. Moreover, RT-PCR using PVY strain specific primer pairs revealed that these isolates belonged to NTN group.

Keywords: Tomato, *Potyvirus*, DAS-ELISA, ACP-ELISA and RT-PCR

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