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Growth inhibition of *Aspergillus flavus* and aflatoxin B₁ reduction in Pistachio by *Trichoderma* strains

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ABSTRACT

In this investigation the effect of *Trichoderma* isolates in inhibition of *Aspergillus flavus* growth and reducing of aflatoxin B₁ (AFB₁) was studied in culture media and pistachio nuts. Among *Trichoderma* isolates, T1, T3, T4 and T17 isolates showed significant impact on inhibiting of *A. flavus* R5 growth. T3 and T4 isolates were the most effective isolates, which caused 84.40% and 77.88% reduction of aflatoxin produced by *A. flavus* R5 on pistachio and 88.03% and 79.73% reduction of aflatoxin B₁ which was added to the medium respectively. In order to study the way the *Trichoderma* isolates affected the pathogen, the influence of volatile compounds and filtrate culture extract of *Trichoderma* isolates on *A. flavus* R5 growth were investigated. Study on volatile compounds effects showed that T1, T3, T4 and T17 isolates with 60.66%, 68.88%, 63.33% and 59% reduction of fungal growth, respectively. The results showed that T1, T3, T4 and T17 isolates could inhibit the mycelia growth of *A. flavus* in PDB liquid medium. Isolates of T3 and T4 caused 58.88% and 50.01% reduction of fungal biomass, followed by 90.76% and 86.25% reduction of aflatoxin B₁ (AFB₁), respectively. Results of the most experiments that was done in this study showed that T3 and T4 isolates are the most effective isolates in biological control of *A. flavus* R5. According to ITS1- 5.8s- ITS2 Gene Sequence analysis, T1, T3 and T4 isolates belonged to *T. harzianum*, *T. longibrachiatum* and *T. harzianum*, respectively.

Keywords: AFB₁ reduction, aflatoxin, *Aspergillus flavus*, Pistachio, *Trichoderma*.

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**Comparable application cultural, biological and chemical control of
pests, diseases and weeds in rice
(Analayzing economical and farming factors among paddy farmers in
Mazandaran Province)**

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ABSTRACT

The aim of this study was to comparable application cultural, biological and chemical control methods of pests, diseases and weeds in rice among paddy farmers in Sari County. A sample of 260 farmers was selected by using proportional random sampling method. Data were collected by means of a questionnaire. Validity of questionnaire was confirmed by Agricultural Jihad experts of Sari County and some faculty members at University of Tehran. Cronbach's alpha was used to estimate the reliability which founding to be acceptable. According to the findings, farmers' awareness of pests, diseases and weeds control methods in the 53.5% of paddy farmers is relatively high. The most of the paddy farmers in order to crop pests management applied cultural and chemical control methods. In addition, biological control practices had allocated last priority to itself. In order to control of rice diseases, the most of them used cultural and chemical control methods. In contrast paddy farmers didn't use biological practices to control of rice diseases. The most of farmers applied weeds cultural and chemical control methods, in contrast, biological practices to weeds control had allocated last priority to itself.

Keywords: chemical control, economical factors, farming factors, non-chemical control, paddy farmers.

Effects of superparasitism on reproductive fitness of *Ooencyrtus fecundus* Ferriere & Voegelé (Hym. Encyrtidae), egg parasitoid of sunn pest, *Eurygaster integriceps* Puton (Hem. Scutelleridae)

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ABSTRACT

Ooencyrtus fecundus Ferriere & Voegelé (Hymenoptera: Encyrtidae) is one of the gregarious egg parasitoids of sunn pest that can superparasitize the host. Superparasitism has inverse effects on fitness, reproductive potential, competition ability and adult size of gregarious parasitoids. In this study, the effects of superparasitism and its intensity (four levels including singleton, twin, triplet and quadruplet females) was investigated on biological features of *O. fecundus* under laboratory conditions. Stable population growth parameters were compared as fitness indicators among four treatments. Significant differences were observed in all parameters except generation time (T). Intrinsic rate of increase (r_m) was estimated to be 0.2529 ± 0.0024 , 0.2480 ± 0.0019 , 0.2389 ± 0.0023 and 0.2354 ± 0.0019 per day in single, twin, triple and quadruple females, respectively. On the other hand, net reproductive rate (R_0) was 198.14 ± 7.22 , 188.63 ± 6.72 , 170.54 ± 2.04 and 139.77 ± 2.01 offsprings and generation time (T) was 20.9 ± 0.29 , 21.12 ± 0.18 , 21.5 ± 0.21 and 20.98 ± 0.15 days in those treatments, respectively. Although parameters were close to each other, their differences were still significant because their variance was low. In most cases, parameter values were significantly different between singleton and twin females with triplet and quadruplets. Superparasitism affected fitness of individuals, however this effect was not so strong that causes superparasitism remove and it seems that it can also grant considerable advantage to the wasp when host density is scarce.

Keywords: life table, *Ooencyrtus fecundus*, parasitism, superparasitoid.

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Survey on entomopathogenic nematodes in families steinernematidae and heterorhabditidae in North Khorasan

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ABSTRACT

Entomopathogenic nematodes (EPNs) are one of the most important biocontrol agents. The identification of these agents has become very important issue due to the developing trend of their applications in the recent decades. A survey for isolation of EPNs was conducted in Bojnourd region, from three different habitats. Subsequently, morphological and molecular characteristics as well as cross breeding tests were used to identify those native isolates. Among 50 soil samples, 5 samples were positive including 10 populations. Both *Steinernema* and *Heterorhabditis* genera were isolated using *Galleria* trap method. According to morphological and morphometric characters, four isolates, namely Boj1, Boj7, Boj8 and Boj9 were from "*feltiae*" species group of *Steinernema*. Another isolate, HBoj was a member of "*bacteriophora*" species group of *Heterorhabditis*. The phylogenetic analysis on sequence data of ITS showed that Boj1, Boj7, Boj8 and Boj9 attributed to "*feltiae*" group, while HBoj isolate belonged to "*bacteriophora*" group. Reconstruction of phylogenetic trees using ITS sequences showed that four isolates, Boj1, Boj7, Boj8 and Boj9 were grouped in a clade with other species of "*feltiae*" group (of *Steinernema*). Phylogenetic analysis on those genes for HBoj isolate grouped this isolate with *H.bacteriophora* species in a clade. Cross breeding tests between Boj1, Boj7, Boj8 and Boj9 isolates and reference strain of *S. feltiae* showed that Boj1 belongs to the *S. feltiae* species. The other three isolates (Boj7, Boj8 and Boj9) were species from *Steinernema* genus. Current survey is the first study on native populations of EPNs in North Khorasan.

Keywords: entomopathogenic nematode, *Heterorhabditis*, ITS, morphology, North Khorasan, phylogeny, *Steinernema*, taxonomy.

Effect of male to female ratio on fecundity and fertility of *Hippodamiavariegata*(Col.: Coccinellidae)

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ABSTRACT

Many of insects have re-mating behaviour during their reproductive period. The re-mating phenomenon has been observed in many ladybirds, too. In current study, the change of proportion of male to female (sex ratio) was used in order to changing of possibility and times of re-mating in *Hippodamiavariegata*. In previous studies it has been indicated that males make up about 50% of this predator's population. To examine change in sex ratio, one day old and virgin females and males have been used. Treatments included: 10 females without male, 10 females with the presence of 2 males, 10 females with the presence of 4 males, 10 females with the presence of 6 males, 10 females with the presence of 8 males and 10 pairs of females and males together. Number of eggs was counted and recorded for 20 days. Then, effect of the male: female ratio on egg production and hatching rate was evaluated. The results of this research showed that there was no significant difference between treatments about egg production. In other words, decreasing the ratio of male, female havenot got any negative effect on female egg production. Evaluating the fertility in different treatments showed that, despite popular perception, the presence of 10 males with 10 females not only did not increase the amount of fertility but also decreased it. This illustrates that incidence of re-mating causes declining female's fitness. This finding has been discussed from practical point of view.

Keywords: biological control, *Hippodamiavariegata*, male abundance, mass rearing.

Effects of two arbuscularmycorrhizal fungi, *Glomusmosseae* and *Glomusintraradices* on pea root rot disease caused by *Fusariumsolani* f. sp. *pisi* under greenhouse conditions

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ABSTRACT

In the present study, the effects of two arbuscularmycorrhizal fungi, *Glomusmosseae* and *Glomusintraradices*, alone and in combination, on the growth parameters, chlorophyll and the root-rot disease of pea (*Pisumsativum*) caused by *Fusariumsolani* f. sp. *pisi* were evaluated under greenhouse conditions. Eight different treatments in four replications were designed in randomized blocks. Compared with the non-treated controls all AM treatments increased plant growth parameters and chlorophyll of treated plants. Based on the results individual inoculation with *G. mosseae* was more effective than *G. intraradices* and dual (*G. intraradices* + *G. mosseae*) inoculations. Inoculation of *F. solani* f. sp. *pisi* without *G. mosseae* and *G. intraradices* treatments caused a significant reduction in plant growth parameters and chlorophyll of treated plants (at 1%) over the uninoculated control. In the presence of *G. mosseae*, *G. intraradices* and dual inoculation of *G. mosseae* plus *G. intraradices*, root colonization by *F. solani* f. sp. *pisi* was decreased but individual inoculation with *G. mosseae* was more effective than other treatments. Inoculation of *G. mosseae* and *G. intraradices* caused a significant increase in plant growth parameters and chlorophyll of pathogen inoculated plants compared with inoculated pea plants with *F. solani* f. sp. *pisi*. Based on the results, application of *G. mosseae* found to be the best for reducing the root rot disease severity and improving plant growth parameters of pea.

Keywords: arbuscularmycorrhiza, chlorophyll, growth parameters, *Pisumsativum*.

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Spatial distribution pattern of pea aphid, *Acyrtosiphonpisum* and predatory ladybirds *Coccinellaseptempunctata* and *Hippodamiavariegata* in alfalfa fields of Hamedan

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ABSTRACT

The distribution pattern of pest population is one of the factors not only effects on sampling program and data analysis method, but also can be used to measure the density of pests and their natural enemies. Thus, the spatial distribution pattern of the pea aphid, *Acyrtosiphonpisum* Harris (Hem.:Aphididae) and its two major predators, *Hippodamiavariegata*Goeze (Col.: Coccinellidae) and *Coccinellaseptempunctata* (Linnaeus, 1758)(Col.: Coccinellidae) was investigated by different dispersion indices through 2012 and 2013 growing seasons. Dispersion pattern was determined by using Taylor's power law, Iwao's patchiness regression method and variance to mean ration test. Obtained results showed an aggregated distribution pattern of pea aphid and lady beetles. Based on R^2 and p-value of regression analysis, Iwao's patchiness regression model provided a slightly more adequate description of variance/mean relationships than Taylor's power law. Among the species studied, the pea aphid adults and *H. variegata* showed the highest and *C. septempunctata* showed the smallest coefficients of Taylor's power law respectively. These results provide a reliable basis to develop efficient sampling plans for estimating aphid and their natural enemies populations.

Keywords:Iwao's patchiness regression model, spatial dispersion, Taylor's power law.

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Culture medium designing for semi-industrial production of *Bacillus subtilis* UTB96

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ABSTRACT

The purpose of this research was to design a semi-industrial culture medium to obtain the maximum biomass production from bacterium *Bacillus subtilis* UTB96. In the first step, in order to reduce the cost of culture medium components, commercial products and industrial byproducts including, sugar beet molasses, sugar cane molasses, potato waste water and milk serum as carbon sources and corn steep liquor, as a nitrogen source were studied. In addition some inorganic compounds including ammonium sulfate, urea, granular fertilizer urea, dihydrogen ammonium phosphate were comparatively evaluated. The designed culture medium with defined components were applied in both laboratory and semi-industrial scale bioreactors and the biomass production and antagonistic effect of bacterium were compared with together. The results showed, sugar cane molasses and corn steep liquor as industrial carbon and nitrogen sources respectively, at concentrations of 10 and 2 g/lit respectively can be used in high-scale production of biological control agent *B. subtilis* UTB96. Finally, the designed culture medium application in semi-industrial scale bioreactor resulted in biomass production of 0.32 g/lit. The bacterium grown in this culture medium had antifungal activity on both pathogenic agents, *Aspergillus flavus* and *Phytophthora drechsleri* with 50 and 70% inhibition respectively. Whereas the application of designed culture medium in laboratory scale bioreactor resulted in biomass production of 0.31 g/lit. Bacterium grown in this bioreactor has antifungal effect on *A. flavus* and *P. drechsleri* with 78 and 54% inhibition, respectively.

Keywords: biocontrol, biomass, by-products, carbon and nitrogen sources and fermentation.

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فهرست
کنترل بیولوژیک آفات و بیماری های گیاهی
دوره ۲، شماره دوم، پائیز و زمستان ۱۳۹۲

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