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UNIFORM FARM OPERATIONS (UFO) ON HEMP BROOM RAPE SEED GERMINATION BY BIOLOGICAL CONTROL MANAGEMENT IN IRAN

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Abstract

Weeds are a constant problem in agronomy and they not only compete with crops for water, nutrients, sunlight, and space but also harbor insect and disease pests; clog irrigation and drainage systems; undermine crop quality; and deposit weed seeds into crop harvests. In order to the microbial herbicide (Orocide) influence on seed germination in Orobancheramosa L., this experiment was conducted in 2011 at Islamic Azad University Shahr-e-Qods Branch in Tehran by a completely randomized design with four replications. The factor studied included use of Orocide (0(T1), 2(T2), 4(T3) and 6(T4) percentage). The results showed that the effect of microbial herbicide (Orocide) was significant on germination percentage of Orobancheramosa. Mean comparison showed that the highest germination percentage (79%) was achieved by non-application of Orocide and lowest germination percentage (8%) was achieved by application of 4% Orocide.The results of this experiment showed that the use of Orocide can decreased the germination in Orobancheramosa L. that is uniform farm operations (UFO) very important for weed biological control management at Iran.

Key words: *microbial herbicide, Orobancheramosa L, Orocide, seed germination*

INTRODUCTION

A weed in a general sense is a plant that is considered by the user of the term to be a nuisance. The word is normally applied to unwanted plants in human-controlled settings, especially farm fields and gardens, but also lawns, parks, woods, and other areas. More specifically, the term is often used to describe any plants that grow and reproduce aggressively [1]. *Orobancheramosa* is a species of broomrape known by the common names hempbroom rape and branching broomrape. It is native to Eurasia and North Africa, but it is known in many other places as an introduced species and sometimes a noxious weed. It is a pest in agricultural fields, infesting crops including tobacco, potato and tomato. The plant produces many slender, erect stems from a thick root. The yellowish stems grow 10 to 60 centimeters tall and are coated in glandular hairs. The broomrape is parasitic on other plants, draining nutrients from their roots, and it lacks leaves and chlorophyll. The inflorescence bears several flowers, each in a yellowish calyx of sepals and with a tubular white and blue to purple corolla [2],[3],[4].
The basidiomycete fungus, *Chondrostereumpurpureum* Fr. Pouzar, has been found to be a good potential bioherbicide candidate for control of hardwood vegetation in forests. However, its interaction with some agrochemicals that are normally employed in forest protection was not known. Employing two concentrations (0.01% v/v and 0.1% v/v) of several agrochemicals, a laboratory study was conducted to assess their impacts on the infective mycelia. Except for Bond, and Suntan gel-2, most adjuvants, sunscreen agents, and pesticides (herbicides, fungicides, and insecticides) were fungi toxic at 0.1%. Fungi toxicity was concentration dependent and the results indicate that the possibility of tank-mixing the basidiomycete with agrochemicals appears limited and the possibility of agrochemical residue effects on survival of the basidiomycete is implied [5].The overriding principle of the bioherbicide approach has been that a host-specific, coevolved natural enemy can be used

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as a bioherbicide when applied in simple formulations at inundative levels; however, two decades of research has effectively disproven this principle. Although research has revealed weaknesses in the bioherbicide approach, it has also revealed potential in a number of areas. A number of niche situations will remain in which host-specific plant pathogens can be developed as bioherbicides, such as for parasitic weeds and narcotic plants, but more research should be conducted with virulent, broad host range organisms, and more effort should be devoted to developing techniques for the cultural and genetic enhancement of bioherbicidal organisms [6]. Therefore, the objective of this study was to evaluate the microbial herbicide influence on seed germination in *Orobancheramosa* for weed biological control management (WBCM) at Iran.

MATERIALS AND METHODS

In order to carry out the microbial herbicide (Orocide) influence on seed germination in *Orobancheramosa*, this experiment was conducted in 2011 at Islamic Azad University Shahr-e-Qods Branch in Tehran by a completely randomized design with four replications. The factor studied included use of Orocide (0, 2, 4 and 6 percentage).
Orobanche ramose seeds were collected from Shahr-e-Qods zone and were transported to the laboratory. Then in each Petri dish 100 seeds were placed between two layers of paper culture and added Orocide (0(T1), 2(T2), 4(T3) and 6(T4) percentage) and then Petri dishes were placed in Germinator for 20 days at 18 to 20C. Finally, percent germination for *Orobanche ramose* by following formula:

(Number of Seeds Germinated/Total Number of Seeds on Petri Dish) * 100

Data were subjected to analysis of variance (ANOVA) using Statistical Analysis System [SAS, 1988] and followed by Duncan's multiple range tests. Terms were considered significant at $P < 0.05$.

RESULTS AND DISCUSSIONS

The results showed that the effect of microbial herbicide (Orocide) was significant on germination percentage of *Orobancheramosa*. Mean comparison showed that the highest germination percentage (79%) was achieved by non-application of Orocide and lowest germination percentage (8%) was achieved by application of 4% Orocide.

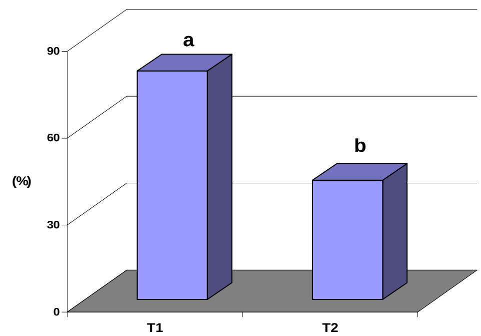

Fig.1. Germination compression in *Orobanche ramose* at T1 and T2 levels of Orocide

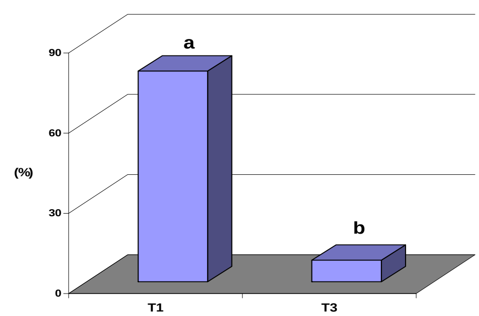

Fig.2. Germination compression in *Orobanche ramose* at T1 and T3 levels of Orocide

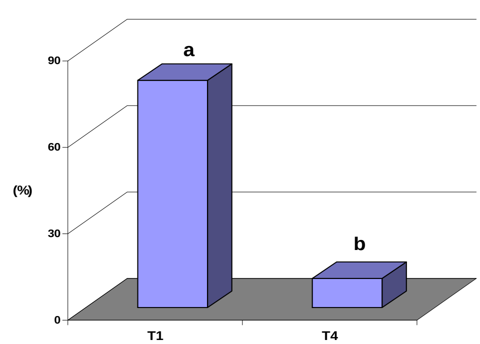

Fig.3. Germination compression in *Orobanche ramose* at T1 and T4 levels of Orocide

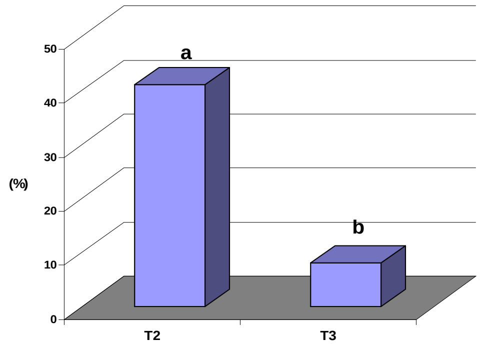

Fig.4. Germination compression in *Orobanche ramose* at T2 and T3 levels of Orocide

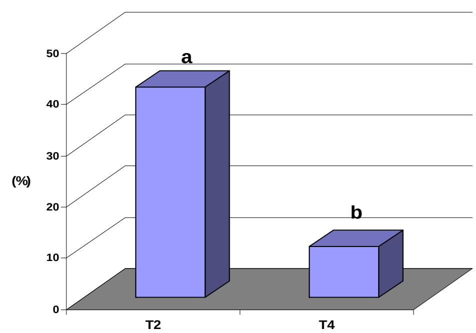

Fig.5. Germination compression in *Orobanche ramose* at T2 and T4 levels of Orocide

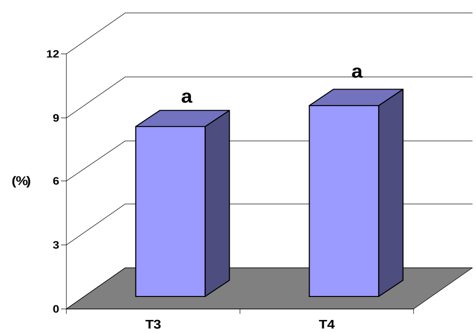

Fig.6. Germination compression in *Orobanche ramose* at T3 and T4 levels of Orocide

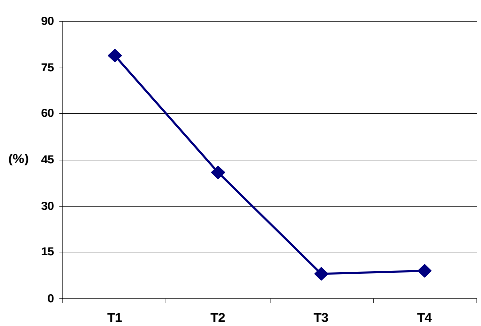

Fig.7. Germination variations in *Orobanche ramose* in levels of Orocide

Our findings showed that Orocide microbial herbicide decreased germination percentage in *Orobancheramose* sorely that is very important in agronomy without this dangerous weed. An isolate of the fungus *Dactylariahigginsii* obtained from purple nutsedge in Florida was highly pathogenic to *Cyperus* spp. The potential of this isolate as a bioherbicide was field tested in natural populations of purple nutsedge in Gainesville and Jay, FL. The fungus was applied in 0.5% Metamucil as a carrier, and the treatments were: carrier only, 105 conidia/ml + carrier, and 106 conidia/ml + carrier. Treatments were applied as single, double, or triple postemergence (POST) sprays at biweekly intervals. The disease and secondary infections developed in about 5 and 15 d after inoculation, respectively, killing most of the infected leaves. All weed growth parameters and disease progress rates were affected by inoculum dosage and inoculation frequencies. Three inoculations, each at 106 conidia/ml, provided effective control of purple nutsedge compared to a single inoculation, as measured by shoot dry weight, tuber numbers, and tuber dry weight. Higher rates of disease progress and disease levels, defined by the area under the disease progress curve (AUDPC), occurred with three inoculations at 106 conidia/ml. Disease progress was slower and the level of weed control was lower at 105 conidia/ml compared to the higher inoculum level. Three applications of 106 conidia/ml provided > 90% nutsedge control. Dactylariahigginsii appears to be an effective bioherbicide candidate deserving further development for commercial use [7].Velvetleaf (Abutilon theophrastiMedik) is difficult to control with existing weed control strategies. Some measure of control can be obtained with a fungus, *Colletotrichumcoccodes* (Wallr.) Hughes, used as a bioherbicide, but when the bioherbicide application was combined with the plant growth regulator thidiazuron (N-phenyl-N′-1,2,3-thidiazol-5-yl-urea), weed control was substantially improved. Thidiazuron alone interfered with normal development of velvetleaf, causing stunting and initiation of axillary bud growth. Tank mix applications of *C. coccodes* and thidiazuron acted synergistically to increase velvetleaf mortality. When *C. coccodes* was applied 10 days after thidiazuron as a split application, weed control was less than for tank mix applications. However, two applications of *C. coccodes* plus thidiazuron were more effective than equivalent single tank mix applications. Under laboratory conditions, high concentrations of thidiazuron (2× field application rates) inhibited growth of *C. coccodes*, but at field application rates thidiazuron did not reduce disease development. Combinations of thidiazuron and *C. coccodes* may provide effective control of velvetleaf in the field [8].The suitability of a bioherbicide as a component of an integrated weed management program not only relies on its field efficacy, but also on its compatibility with other pest control measures that may be employed during the cropping season. The effects of selected pesticides applied according to label rates on *Dactylariahigginsii*, a biological control agent for purple nutsedge, were determined using mycelial growth on pesticide-amended potato dextrose agar (PDA) and conidial germination as indicators of pesticide sensitivity. Among the pesticides tested, the herbicides oxyfluorfen and sethoxydim and the fungicides fosetyl-Al and thiophanate methyl inhibited *D. higginsii*mycelial growth and reduced or completely inhibited conidial germination; the herbicide diuron, the fungicides metalaxyl and copper hydroxide, and the insecticide cyromazine reduced mycelial growth but did not reduce conidial germination. The miticidedicofol reduced mycelial growth and completely inhibited conidial germination while the herbicide imazapyr had no adverse effect on either the mycelial growth or conidial germination of *D. higginsii*[9].

CONCLUSIONS

The highest germination percentage (79%) was achieved by non-application of Orocide and lowest germination percentage (8%) was achieved by application of 4% Orocide. The results of this experiment showed that the use of Orocidecan decreased the germination in *Orobancheramosa* L. that is very important for weed biological control management (WBCM) at Iran.

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