The Quarterly Scientific Journal of Applied Biology

Vol.37, No.4, Sering.82, Winter 2024, p. 20-22

Journal homepage: https://jab.alzahra.ac.ir

doi.org/10.22051/jab.2024.48975.1661

Allelopathic Effect of *Orobanche aegyptiaca* Pers Weed on Some Morpho-Physiological and Biochemical Characteristics of *Lycopersicon esculentum* Mill

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Introduction

Weeds are unwanted and undesirable plants that grow in their non- original habitation. One of the most important factors in reducing the quantitative and qualitative value of agricultural products are weeds. In general, the lack of control of weeds in fields causes significant damage to agricultural products. In contrast, if weeds are controlled, the yield of agricultural products increases by 30 to 50 percent. Interference in plants includes competition for environmental potential and allopathy. Allelopathic substances are biochemical interactions between plants that are released from plants to the surrounding environment through different ways such as leaching, decomposition of plant residues, root exudation, and volatilization. These compounds affect important ecological and physiological processes of adjacent plants. The weed of *O. aegyptiaca* is from the *Orobanchaceae* family, a member of the group of flowering plants that has nearly 200 species. This genus has 36 species in Iran, all of which are parasites of other plants. The most important species of *O. aegyptiaca* in the tomato fields of Iran are the *O. aegyptiaca*. Rehman et al. (2015) reported the presence of biologically active secondary compounds such as alkaloids, tannins, flavonoids, glycosides and phenols in *Orbanche agyptica*. While, the compounds of saponins, coumarins, glycosides and anthraquinones were not present in the plant under study. Tomato with the scientific name of *Lycopersicon esculentum* from the *Solanaceae* family is one of the warm season vegetables, which has a special importance among vegetables in Iran in terms of cultivated area.

Material and Methods

The purpose of this experiment was to evaluate the allelopathic potential of stem and flower parts of *O. aegyptiaca* weed and a mixture of them on morphological, physiological and biochemical characteristics of *L. esculentum*. In this experiment, the sample of *O. aegyptiaca* weed was collected in the full maturity stage from the surface of tomato fields in Ravansar region which located in Kermanshah province (Iran). After the botanically authentication of the sample with the help of experts in Gonbad Kavous University, it was separated into stem and flower organs, and then the samples were dried until they reached a constant weight (Caceres, 2000). In the next step, the dried samples were crushed by a grinder and then passed through a sieve. The samples were stored in plastic bags before starting the experiment. Then a base solution of 5 % (weight to volume) was prepared from each of these parts and a mixture of them, and then 250 mL of each of them was applied to 7-day-old *L. esculentum* seedlings in four liters of hydroponic culture medium.

Result and Discussion

According to the results, studied characteristics of *L. esculentum* under aqueous extract of stem and flower of *O. aegyptiaca* and mixture of them indicated different behavior compared to the control. The greatest reduction effect on root length, leaf area, seedling dry weight, content of total chlorophyll and carotenoid pigments of *L. esculentum* were observed with application of the flower aqueous extract of *O. aegyptiaca*. In this study, amount of damage to protein and starch were decreased with an increase in total phenol content in *L. esculentum* under aqueous extract of various treatments of *O. aegyptiaca* especially flower. Since carbohydrates are required for the synthesis of phenolic compounds. Therefore, an increase in their amount indicates an increase in the synthesis precursor of phenolic compounds in the shikimic acid pathway. A number of researchers have reported that the increase in phenolic compounds is related to the balance between carbohydrate intake, so that wherever there are more carbon hydrates, the phenolic compounds are also more numerous (Mullera et al., 2013; Lattanzio et al., 2009). These results show that the stem and flower organs probably have a low concentration of total phenol, which can play an antioxidant role to some extent, so that the tested plant under the flower organ extract had a higher amount of protein and total phenol.

Conclusions

Considering that the *O. aegyptiaca* is found abundantly in horticulture crop including tomato, therefore, it is suggested to use its bioactive compounds as herbicides with biological origin or the formulation of synthetic poisons. This requires the investigation of the bioactive compounds in the weed of *O. aegyptiaca* flower and proving its positive effect on other species.

Keywords: Base solution, Organs, Protein, Seedling dry weight, Total phenol.

Acknowledgement

The authors express their gratitude to the officials of the central and botanical laboratories of Gonbad Kavous University for their help in facilitating the experiment.

Declaration of conflict of interest

The authors declare that they have no conflicts of interest.