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EFFICIENCY EVALUATION OF SOME PLANT EXTRACTS FOR CONTROLLING OF BARLEY COVERED SMUT CAUSED BY *USTILAGO HORDEI*

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Abstract

Results showed isolate of fungus *Ustilago hordei* from all samples of barley seeds which collected from (Ramadi, Fallujah, Heet and Al ameria) in Al-anbar province. The results indicated used of some plant extracts (Colocynth, Mints, Pomegranate peel) were used four concentrated (2,4,6,8 gm.l^{-1}) to reduced of infection percentage of barley covered smut without effect of germination seeds of barley, also the results indicated concentration (6,8gm.l^{-1}) colocynths to reduced of infection percentage of barley covered smut to 5% compared with control treatment in which the infection by *U. hordei* reach 30%.Result showed all concentration of plant extracted to increased of total vegetative length and weight of seeds compared with control treatment that contaminated by *U. hordei*

Keywords : Plant extracts, barley covered smut, *Ustilago hordei*.

Introduction

Barley crop (*Hordeum vulgare* L) is one of the most important grain crops in the world. in Iraq the planted with this crop reached (26650 hectares) with total production reached (499100 tons) (F.A.O. 2017). This crop is exposed to many agricultural pests and perhaps the most dangerous is the *Ustilago hordei* (pers) *Langerh.* The symptoms of this disease are seen in most of the world's barley production areas (Mathre, 1997) Although the annual loss rate is only 1% but this ratio is sufficient to make the infected plants unsuitable for seeds production that are used later for sowing (Thomas and Menzies 1997). The transmission of this disease on the surface or inside the seed coats makes it more dangerous (Grewal *et al*., 2008). Also the spores found with the grain used in human food and animal feed lead to the incidence of Ustilaginism disease, which affects the secretion of adrenaline and nervous system (Osha, 2007).

Many chemical pesticides have been used to disease control, such as Dithane, Carboxin (Albeldawi *et al*., 1981; Shamsullah, 2005). However, the use of pesticides is not consistent with strategies to prevent the use of substances which harmful to humans, animals and the environment (Mehrotera *et al*., 1997). It was also observed that some strains of pathogen *U. hordei* resist the action of chemical pesticides (Henry *et al*., 1987; Leroux and Berthior 1988). Therefore, the researchers resorted to the use of substances that do not affect the living organisms and the environment, the most important of which are plant extracts that have proved highly efficient in resistance to plant diseases, such as colocynth, pomegranate peel and catnip (Majid and Habeeb; Ahmed, 2013; Aljabori *et al*., 2015).

Which have impact because of their content from compounds which prevent or inhibit the growth of microorganisms, such as alkaloids, glycosides, Flavonoids, sapindales, volatile oil, glues, tannins and menthol compounds (Khalafallah, 1988; Majid and Mahmood 1988). Therefore, this study aimed to:

1. Isolating the pathogen from the barley seeds infected with the covered Smut from different areas of Al-anbar province.
2. Study the effect of some plant extracts with different concentrations to control the covered Smut in barley and its impact on some different growth parameters.

Materials and Methods

Sampling

Samples were collected from infected barley farms for the winter season 2016 -2017 from some areas of Al-anbar province (Al-ramadi, Heet, Al-fallujah, Al-amerea). The infected spikes with covered Smut collected (the seeds except the outer coats were transformed into a black carbonized mass of *U. hordei* spores). Based on the pathological symptoms and the form and color of spores described from (Agrios, 2005) infected seeds were identified and kept in perforated paper bags under laboratory conditions.

Plant Extracts Preparation

The plant extracts were prepared according method of (Al-Mayah and Al-waily 2002) with the weight of (8.6, 4, 2 gm) from dry powders of the plants (colocynth, pomegranate peel and catnip) which obtained from local markets in Al-anbar. Then each of

the substances dissolved in 100 ml of distilled water. The centrifugation process was then carried out at 3000 cycles / minute for 10 minutes. The solution was then completed for each weight of plant extracts per liter, then the samples were placed in the centrifuge at 3000 cycles / min for 10 minutes and the solution completed for each weight of the plant extracts to one liter.

Effect of different concentrations of plant extracts on the germination percentage of local barley seeds

This experiment was conducted in the Laboratory of Plant Pathology, college of Agriculture, Anbar University, according to randomized complete block design (RCBD) using factorial experiments pattern. The seeds were washed to remove the soil and the external crusts, and the wet barley seeds were contaminated with the disease pathogen *U. hordei* Hassan, M.S.H. (2006). The contaminated barley seeds were divided into concentrations of plant extracts distributed in plastic bottles with capacity of (250 ml). Five replicates were used for each concentration of plant extracts using 10 seeds per replicate. In addition to contaminated control treatment and free control treatment in plastic bottles contain distilled water. The treatments were left for 24 hours after that the plant extracts were added to all concentrates and distilled water for the contaminated and free control treatment and then barley seeds were left in the plastic bottles for 7 days. Then the percentage of germination of barley seeds was calculated according to the following equation:

$$\text{Germination percentage } (\%) = \frac{\text{Number of germinated seeds for each concentration}}{\text{Total number of used seeds from each concentration}} \times 100$$

Effect of different concentrations of plant extracts in control of covered smut on barley and some growth and productivity parameters

This experiment was conducted on 29/11/2017 in the Department of Plant Protection, college of Agriculture, Al-anbar University according to randomized complete block design (RCBD). Then the contaminated barley seeds with *U. hordei* distributed on glass bottles (250ml) the contaminated seeds left for 5 days then the concentrations of plant extracts were prepared as mentioned previously and added to the bottles containing contaminated seeds. 30 seeds were used for each concentration, after 48 hours the plant extracts and samples water of contaminated control treatment and free control treatment, then the seeds were planted in pots contains sterile soil using (Osha, 2007) seeds per pot. Five pots were used for each concentration of plant extracts and two pots for contaminated control treatment and free control treatment after the growth of the crop was completed on 4/5/2018, the infection percentage and the total vegetative length from the soil surface to the highest point were calculated. As well as the grains weight for five spikes of each concentration of plant extracts and compared to contaminated control treatment and free control treatment.

The infection percentage was calculated according to the following equation

$$\text{Infection percentage } (\%) = \frac{\text{Number of infected plants per each concentration}}{\text{Total number of plants in each concentration}} \times 100\%$$

Results and Discussion

The results of the sampling showed that the Covered Smut disease caused by the *U. hordei* was found in all collected samples from different areas of Al-anbar province. This is in agreement with results of (2) also the results showed the effect of different concentrations (8, 6, 4, 2 gm.L^{-1}) of plant extracts of colocynth, pomegranate peel and Mints. Table (1) all plant extracts treatments and all concentrations did not affect the germination percentage of barley seed which was 88-90% compared with the free control treatment that gave 90% and contaminated control treatment with *U. hordei* which gave lowest germination percentage reached 88%. This indicates that the plant extract has no negative effect on the vitality of the treated seeds. The results also indicate that the same extracts with the same concentration affect the infection percentage (Table 2). The most effective extracts was colocynth extract where the infection percentage in seeds treated with concentrations (8, 6, 4.2 gm.L^{-1}) (10%, 10%, 5%, 5%) respectively. The results showed that pomegranate peel and catnip extracts with concentrations of (4.2 gm.L^{-1}) did not significantly affect the reduction of infection percent which reached 35% and 20% in the treatment of pomegranate peel extract while reached 25% and 20% in catnip treatment. the treatments of concentrations (8, 6 gm.L^{-1}) resulted in a significant reduction in infection percentage reached 15% and 5% for both pomegranate peel and colocynth extracts concentrations compared to contaminated control treatment with *U-hordei*, which has a 30% infection percent. These results are due to the presence of antimicrobial growth substances in these extracts, such as alkaloids, glycosides, Flavonoids, sapindales, volatile oil, glues, tannins and menthol compounds (Majid and Habeeb; Ahmed, 2013; Aljabori *et al*., 2015; Khalafallah, 1988; Majid and Mahmood 1988). The results also showed that the use of plant extracts at concentrations of (6, 8 gm.L^{-1}) led to a significant increase in plant height and seeds weight (Tables 3, 4) compared to contaminated control treatment with *U-hordei*. These results confirm that the use of these extracts led to an increase in plant resistance and thus increase the parameters of growth and productivity (Majid and Habeeb; Ahmed, 2013; Aljabori *et al*., 2015).

Table 1 : effect of different concentrations of mints, colocynth and extracts in percentage of local Barley germination under laboratory conditions.

Cons. / Extract	2 gm.L^{-1}	4 gm.L^{-1}	6 gm.L^{-1}	8 gm.L^{-1}	Extracts mean
Mints	88	89	90	90	89.33
Colocynth	89	89	90	90	89.66
pomegranate peel	89	89	90	90	89.3
contaminated control					89
Free control					90
Conc. Mean	88.86	88.86	90	90	

• Each number represents an average of five replicates and each replicate contains 10 seeds
• L.S.D values: plant Ectr. (1.55), concentrations (1.63), interaction treatments (2.10).

Table 2 : Effect of different concentrations of mints, colocynth and pomegranate peel and catnip extracts in percentage of Covered Smut disease on the barley.

Cons. / Extract	2gm.L^{-1}	4gm.L^{-1}	6gm.L^{-1}	8gm.L^{-1}	Extracts mean
Catnip	25	20	15	15	18.7
Colocynth	10	10	5	5	7.5
pomegranate peel	30	20	15	15	20
Cont. control					30
Free control					0
Conc. Mean	21.66	16.66	11.66	11.66	

• Each number represents an average of five replicates and each replicate contains 10 seeds.
• L.s.d values: plant ectr. (8.40), concentrations (9.30), interaction treatments (12.8).

Table 3 : effect of different concentrations of mints, colocynth and pomegranate peel extracts in barley seedling height under laboratory conditions.

Conc. / Extract	2gm.L^{-1}	4gm.L^{-1}	6gm.L^{-1}	8gm.L^{-1}	Extracts mean
Mints	55	55	57	57	56
Colocynth	54	57	58	58	56.8
pomegranate peel	55	55	57	57	56
contaminated control					54
Free control					9057
Conc. mean	54.66	55.33	57.33	57.33	

• Each number represents an average of five replicates and each replicate contains 10 seeds.
• L.s.d values: plant ectr. (1.25), concentrations (1.45) interaction treatments (2.51).

Table 4 : Effect of different concentrations of mints, colocynth and pomegranate peel extracts in seeds weight of local barley.

Conc. / Extract	2gm.L^{-1}	4gm.L^{-1}	6gm.L^{-1}	8gm.L^{-1}	Extracts mean
Mints	42	45	45	45	44.25
colocynth	45	44	46	45	45
pomegranate peel	42	42	54	44	43.25
contaminated control					42
Free control					46
Conc. Mean	43	43.67	45.33	44.76	

• Each number represents an average of five replicates and each replicate contains 10 seeds.
• L.s.d values: plant ectr. (1.54), concentrations (1.77), interaction treatments (2.79).

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