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MANAGEMENT OF BARLEY YELLOW DWARF VIRUS DISEASE BY USING WATER, COLOR TRAPS FOR APHIDS INSECT *MYZUS PERSICAE* SULZ. IN KALAR CITY, IRAQ

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Abstract

In 2018, 2019 season, Survey is doing to show the percentage of Barley Yellow Dwarf Virus Disease in the field of Barley in Kalar city which is belong to Sulaimania Governorate. take 500 sample of Barley plant which appeared symptom same to Barley Yellow Dwarf Virus to test it in ELIZA later, Then we take another sample (600) from the weeds in the same place which is bearing symptom similarity of BYDV disease and tested it according to ELIZA later again. Result indicated that all the weeds species which are takes is contain the virus but in different rate, in addition to Barley plant is infected found. Also we farming Barley grope (Local variety) in according RCBD and using tow traps type (water, colorful) to knowledge the efficiency of it to attractive the Aphids insects which is transfer the virus from infect plants to other healthy plants. This virus diagnoses by ELIZA. Result show that the water traps is more efficient from other color.
Keyword: Barley, traps, Aphids, Management, virus

Introduction

Barley belongs to the Poacecae family, it is one of the oldest plants of this family and its cultivation is widespread in most soils. Including saline and alkaline in addition to reclaimed land, as well as in temperate and dry environments, and it is one of the crops of great economic importance to humans and animals (Harlan, 1979). The cultivation of this crop has expanded due to the ease of cultivation and its suitability for most types of soils. This expansion was accompanied by the emergence of a number of agricultural pests that feed on it, Some of these pests include viral diseases represented by a dwarfing virus and yellowing of barley, Where it causes a loss of 5- 85% of production, according to the virus strain, the sensitivity of the cultivated variety, the type of insect vector, and environmental conditions (Anddret-Link and Fuchs, 2005). The virus was recorded in Iraq on wheat and barley crops by El-Muadhidi and others (2001). Viruses are believed to be one of the main causes of poor productivity in most plant crops (Matthwes, 2002). Skaf *et al.* (1988) found that the incidence of yellow dwarfing virus in barley was 16.3 in barley fields and 3.9% in wheat fields in Syria, Its spread was attributed to the presence of four types of insect aphids, the most important of which are the *Rhopalosiphum padi*. Aphids are *Myzus persicae* Sulz., One of the insects that transmits the virus in nature (Baraett, 1990). The epidemiology of the virus is related to the extent of activity and density of insects, which are affected by the prevailing environmental conditions (Talbouk and Makkouk, 2000). Also, there is a direct relationship between the number of aphids and the rates of infection with the virus (Al-Ansi and others, 2008). Virus stunting and yellowing of barley has a wide family range of almost 150 family species in the evangelical family, It is one of the most important viruses on grass crops, including barley (Al-Ansi and others, 2007; Al-Ansi, 2007; Qasim and Abbou, 2011). While the virus was known for the first time in Syria, depending on the apparent symptoms of infection with this virus (Mamluk and Leur, 1983). Abbas and Gerges 2015 explained the possibility of diagnosing Barley Yellow Dwarf virus (BYDV) in more of ways. The virus causes yellowing and stunting symptoms on most plants, resulting in the death of the majority of plant (Bunett1990: D'Aree, 1995) .It is one of the viruses that are not transmitted mechanically. Symptoms of a viral infection overlap, interaction with symptoms of other infections that may be other physiological or biological, Therefore, infection is detected in the laboratory, including the Enzyme Linked Immune Sorbent Assay (ELISA). For the purpose of confirming the infection (Miller and others, 2002).

Resistance to viral diseases is more complicated and difficult than other plant diseases, which are caused by other pathogens such as Fungi, Bacteria and Nematodes, This is due to the lack of ,or no special pesticides that affect against these viruses and do not affect the cells of the affected plant, because of the virus became part of the plant cell after its entry and its multiplication, therefore some studies have gone towards using resistant varieties and changing planting dates, which aim to preserve the environment and plant contents(Provvidenti, 2000) . Also, for the purpose of limiting and reducing infection with viruses, many attempts, treatments and methods have taken place, most of which have focused on vector resistance and control with the use of chemical pesticides , and the treatment of seeds with them and the use of some mineral oils as a bribe on plants, while others resorted to using reflective mineral chips, as well as some resorted to the use of vegetable and yellow traps (Al-Bayati, 1987; Mansour and others, 2000; Yunus, 2000; Makkouk and Kumari, 2001; Al Najar and others, 2017; Al Bayati, 2018; Al Bayati 2019), also, some studies have turned away from the use of pesticides and resorted to dealing in accordance with the principle of preserving the environment (Deol and Rataul, 1978; Al-Ani, 1994; Difonza and others, 1996; Fereres, 2000; Nameth, 2002; Al-Ansi and others, 2008; Al-Bayati and others, 2010), Therefore, one of the objectives of this study was to preserve the environmental aspect and to know the impact of the use of traps to reduce the number of aphids and thus reduce the chances of a viral infection.

Materials and Methods

Field surveys and sample collection

Field visits to the barley crop were carried out in different fields and different regions in the Kalar region of Sulaymaniyah Governorate during the two agricultural seasons 2018, 2019, and samples (500 vegetable samples) were collected from barley plants that showed similar symptoms of infection with viruses, for the period 10/12 to 20/12 of each year. And I repeated the process for the period from 10/2 to 20/2, and for the period from 10/4 to 20/4 for the same years (different growth stages), we kept nylon bags and put them in a box made of corks until they were placed in the refrigerator. I also collected samples of some bushes accompanying the barley crop. And we took samples from it which is next Oats (*Avena fatua*), Baker (*Malva rotundifolia*), Wheatiness (*Lolium ridium*), Long (*Convolvulus arvensis*), (*Setaria viridis*) and Wild lettuce (*Lactuca serriola*) from them (600 samples) by take 100 samples for each plant species for the same period above. Samples were stored in the refrigerator until they are used in diagnostic tests using the ELISA method, whereby extracts of vegetable samples and bush samples accompanying the barley crop were taken and by taking 5 g of individual specimen papers and crushed with sterile ceramic mortar after adding 5 ml of standard extraction solution, technique was adopted, (ELISA) Enzyme Linked Imunosorbent Assay, according to Adam & Clark, 1977, in detecting plant viruses, including stunting and yellowing barley BYDV. In samples of barley plants and bushes taken from different places and that using anti-serum for this virus prepared by the American company Agdia blofords.

A pilot field was chosen to grow barley seeds, a local variety in the Kalar region of Sulaymaniyah Governorate, with an area of 200 square meters, The plowing and smoothing operations of the land were performed, and the experiment land was divided according to the design of complete random sectors (Al-Rawi and Abdel Aziz, 1980), With three replications separated by a metric distance between them, barley seeds were cultivated a local variety on 10/25/2018 at a rate of 30 plants per experimental unit and with distances between them reached 20 cm with three lines, , I repeated the experiment the following year with the same date. The crop service work was carried out as recommended (Hassan, 1991). Colorful traps and water traps were used for the purpose of attracting aphids and knowing their densities, where colorful traps were made and are made of the yellowiest plastic material, dimensions of 20*30 cm hanging on a wooden end, 60 cm high, were divided into squares for easy reading of insect numbers, and water traps were placed in the form of a yellow plastic container with a diameter of 30 and a height of 20 cm on a metal stand of 60 cm height. Colorful traps are covered with castor oil and cleaned every two weeks after taking a reading of insect numbers, we take readings for the numbers of aphids found in traps and on barley and bush plants, at 5 leaves/plant, with weekly readings. Viral infection rates were calculated at the experience of two weeks for each reading. The infection rates found in barley and bush samples were calculated according to a bi-monthly readout schedule as well.

Results and Discussion

Diagnosing the virus

Virus detection using ELISA technology

The results of the ELISA test showed the samples of bush plants accompanying the barley crop in the fields and the barley plant samples taken from the barley fields that showed similar symptoms of infection with viruses, It showed the presence of a viral infection with some of these samples, as it gave a positive interaction with the anti-dwarfing serum and yellowing of barley BYDV, As the appearance of the yellow color in the digging of the Elisa dish indicates the presence of the virus under study, and no interaction appeared during the digging of the Elisa dish in the samples taken from other plants samples free of infection (Clark and Adams, 1977).

Definition of viral infection rates

Table No. (1) shows the percentage of infection with barley virus stunting and yellowing of barley in the barley fields surveyed and in the bush accompanying barley (wild oats, baker, wild lettuce, extended, viscous and wheat) in the same barley fields for the agricultural season 2018, where the numbers show that the rates of infection of barley ranged between zero and 7, depending on the stage of plant life , While the infection rates for the bush ranged between 1 and 5 according to the timing and type of bush plant and the baker plant was characterized by the highest incidence of the time when the viscous plant represented the lowest infection rates.

Table 1 : Percentage of infection with stunting virus and yellowing of barley in bush plants and barley for the agricultural season 2018 and according to the stages of growth

Sequence	The name of the plant	percentage points of infection plants with time in virus		
		10-20 / 12	10-20 / 2	10-20/4
1	Wild oats	0.00	3	4
2	Baker	2	4	5
3	Wild lettuce	1	2	4
4	Wild Long	2	3	4
5	Sticky plant	0.00	1	3
6	Wheatiness	2	3	4
7	Barley	0.00	2	7

As for the barley cultivation season in 2019, Table 2 showed the rates of infection with stunting virus and yellowing of barley in the bush plants accompanying the barley plant in its fields that the baker also had the highest end-of-season infection rates While the viscous plant had the lowest rates of viral infection, where the ratios were 8 and 4 for the two plants respectively, while the percentage of infection for barley in the fields of the region was 11% in the last reading before the harvest, and it is noticeable that all the bushes contain the virus, but in varying proportions. , Which

provides suitable conditions for the occurrence of the primary infection in each season, we also find an increase in the rates of viral infection for the year 2019 compared to that of 2018, The reason for this increase may be due to the fact that the 2019 season was more humid and rain, which made the atmosphere more suitable for the movement of the insect vector of the BYDV virus, and from the results of infection rates on bush plants we derive from the result that the primary infection sources of the virus stunting and yellowing of barley are present in these bushes. This is an important indicator of the persistence of the malt infection with the virus under study.

Table 2 : Percentage of infection with stunting virus and yellowing of barley in bush plants and barley for the agricultural season 2019 and according to the stages of growth

Sequence	The name of the plant	percentage points of infection plants with time in virus		
		10-20 / 12	10-20 / 2	10-20/4
1	Wild oats	0.00	3	4
2	Baker	1	5	8
3	Wild lettuce	1	4	4
4	Wild Long	3	4	5
5	Sticky plant	0.00	2	4
6	Wheatiness	2	3	5
7	Barley	0.00	4	11

Reading the insect density

The insect density on the traps

After the diagnosis of *Myzus persicae* Sulz. At Professor Nabil, a professor of insects at the College of Education-Erbil, the number of aphids found in yellow and aquatic traps was calculated separately and through a statistic I took their readings every two weeks, and it is clear from Table No. 3 that the average number of aphids for yellow traps It began to appear during the first half of January 2018 and began to increase and reached its maximum during the first half of April of the same year, while water fisheries showed that there were numbers of aphids in the second half of December 2017 and averages continued to prepare Aphids are growing and culminating during a For the second half of April 2018, And when comparing the general average number of aphids for both traps, we find that the fisheries have exceeded their averages than what is found in the colorful traps, which indicates more efficiency in the fisheries to attract aphids despite the density of the numbers in the yellow traps.

Table 3 : Reading the averages of aphid preparation *Myzus persicae* Sulz. Available in yellow colored traps and water traps, and according to reading periods during the 2018 season

Seq.	Kind of trap	Average number of aphids *M. persicae* According to the bi-monthly readings										Ave.
		20/12	3/1	17/1	31/1	14/2	28/2	14/3	28/3	11/4	25/4	
1	Colcord											
2	Watered											

When looking at the contents of Table 4, which shows the mean numbers of aphids *M. persicae* Sulz. Existing in yellow colored traps and water traps distributed within the experiments of the 2019 season, it is clear that the beginning of insects in yellow traps began late than what appeared in water traps, and both averages continued to increase in readings that followed the first half of February and at a different rate as well, where The mean of insects excelled in the treatment of water traps than in the colorful traps and the maximum readings were during the second half of April of 2019, and this is confirmed by the general average as it reached 8,30 and 6,40 respectively, which gives an impression of the appropriate environmental conditions appropriate for the reproduction of the insect , And attract a monster Manna for fisheries more than colored.

Table 4 : Reading the averages of aphid preparation *Myzus persicae* Sulz. Available in yellow colored traps and water traps, and according to reading periods during the 2019 season

Seq.	Kind of trap	Average number of aphids *M. persicae*. According to the bi-monthly readings										Ave.
		20/12	3/1	17/1	31/1	14/2	28/2	14/3	28/3	11/4	25/4	
1	Colcord	0.00	0.00	10	27	22	34	42	45	55	50	
2	Water	10	27	35	40	36	45	50	55	51	57	

Insect density on Barley plants in experiment plants ,By noticing the mean numbers of aphids found on barley plants (5 leaves / plant) in the experiment coefficients during the 2018 season, we find an increase in the presence of this insect in barley plants that accompany the yellow traps, followed by the treatment of water traps, while the mean of insect preparation in the comparison treatment plants More than both treatments, these results are shown in Table 5 where they show the mean numbers of *M. persicae*. During the season of 2018 in the experiment transactions and according to the timing of taking the reading.

Table 5 : Averages of aphid preparation *Myzus persicae* Sulz. On barley plants in the experimental treatments, according to the date of taking the reading for the 2018 season

Seq.	Tre.	Aids for the preparation of aphids *M. persicae.* Available on 5 leaves of barley in the treatment of experience according to date								Ave.
		17/1	31/1	14/2	28/2	14/3	28/3	11/4	25/4	
1	Barley plants with yellow traps	3	5	8	10	8	14	10	7	8.3
2	Barley plants with water traps	3	2	5	6	9	7	5	7	6.2
3	Barley plants in control	8	12	17	17	11	13	10	13	14.4

Table No. 6 shows the mean numbers of aphids found on barley plants (5 leaves / plant) in the experiment treatments during the 2019 season. Comparative treatment plants were more than both treatments.

Table 6 : Averages of aphid preparation *Myzus persicae* Sulz. On barley plants in experiments and according to the date of taking the reading for the 2019 season

Seq.	Tre.	Aids for the preparation of aphids *M. persicae.* Available on 5 leaves of barley in the treatment of experience according to date								Ave.
		17/1	31/1	14/2	28/2	14/3	28/3	11/4	25/4	
1	Barley plants with yellow traps	3	6	7	8	9	11	10	6	8.5
2	Barley plants with water traps	4	1	4	7	5	6	5	6	5.4
3	Control plant	8	13	15	20	12	10	13	12	14.9

Readings injury ratios

Table No. 7 shows the ratios of viral infection in yellow and aqueous traps coefficients in comparison with the comparison treatment, where we find that these ratios increase with the growth of plants and also increase with the increase in the presence of aphids insects indicated in Table 5, where the proportion of infection has a direct relationship with The mean of aphids on barley plants in experimental treatments, as Table 7 shows that infection rates are less than the presence of water traps indicated in Table 3, where these traps have proven higher efficiency than in yellow traps in attracting aphids and thus reducing their presence on barley plants that Reflected on the reduction of infection, which increased in plants, a comparison treatment that is free of traps.

Table 7 : Infection rates of viral stunting and yellowing of barley for experiment treatments during the 2018 season.

Seq.	Tre.	Percentage of Barley plant which is infected in 2018 season								Ave.
		17/1	31/1	14/2	28/2	14/3	28/3	11/4	25/4	
1	Barley plants with yellow traps	0.00	1	4	6	9	10	10	12	6.5
2	Barley plants with water traps	0.00	2	3	3	5	5	8	10	4.4
3	Control plant	0.00	3	5	9	12	14	14	15	9.00

Table No. 8 shows the ratios of viral infection in yellow and aqueous traps coefficients compared to the comparison treatment. Also, we find that these ratios increase with the growth of plants and also increase with the increase in the presence of aphids that Table 6 indicated, where the proportion of infection has a relationship Parasites with averages of aphids on barley plants in experimental treatments, as Table 8 shows that infection rates are less in the presence of water traps indicated in Table 4, where these traps have proven higher efficiency than yellow colored traps in attracting aphids and thus reducing their presence on plants Barley Reflected on Tech Yale injury which increased in comparison treatment plants without the presence of fisheries where 10% ratios. And compared to the season of 2018, we find an increase in infection rates in all treatments, and this matter is consistent with what Al-Ansi and others reached 2008, and the reason may be due to the availability of appropriate humidity and other conditions for living insects, where the rates of rain rates were high during the 2019 season. .

Table 8 : Rates of infection with stunting virus and malt yellowing for experiment treatments during the 2019 season

Seq.	Tre.	Percentage of Barley plant which is infected in 2019 season								Ave.
		17/1	31/1	14/2	28/2	14/3	28/3	11/4	25/4	
1	Barley plants with yellow traps	0.00	1	5	7	10	11	13	13	7.5
2	Barley plants with water traps	0.00	2	4	5	6	6	7	11	4.1
3	Control plant	0.00	3	8	8	15	15	15	16	10

The results above indicated that aphids are associated with bush plants accompanying barley plants, and these insects have a role in the occurrence of viral infection. The presence of traps reduces the presence of aphids on barley plants and thus reduces the occurrence of infection. The results also indicated that aquatic traps have the ability to attract insects more than in yellow traps and thus were able to determine the presence of aphids on barley plants and their viral infections and thus reduced the occurrence of infection by referring to the rates of injury in the comparison treatment.

References

Abbas, A.Q.K. and Maysar Ma.J. (2015). Serological and molecular diagnosis of Barley Yellow Dwarf Virus, its strain and its spread in Iraq. Iraqi Journal of Agricultural Sciences, 46(6): 977-983.

Al-Ansi, A.; Safaa, Q.; Ameen, A.H.Q.; Khaled, M. and Ismail, M. (2007). Investigating the spread of dwarf viruses and yellowing of barley on cereal and grassy crops in Syria. The Arab Plant.

Al-Ansi, A.; Safaa, Q.; Ameen, A.H.Q.; Khaled, M. and Ismail, M. (2008). The relationship between the activity of winged aphids and the percentage of infection with stunting virus and yellowing of barley. Arab Plant Protection Journal, 26(1): (2008).

Al-Ansi, A.A. (2007). A study of barley stunting and yellowing virus on wheat and barley crops in Yemen and Syria. PhD thesis. faculty of Agriculture. Aleppo University.

Al-Bayati, K.; Hassan, A.; Zwein, Q.K. and Khammas, N.A. (2010). Managing Mosaic Disease, the Caused Virus of the Mosaic Virus (CMV) Transmitted by *Myzus persicae* Sulz. In the region of Bani Saad (Diyala Governorate) in the open fields. Diyala Journal of Agricultural Sciences Volume (4) No. (1) Part One.

Al-Bayati, K.A.H. (1987). The use of mineral oil in resistance to Watermelon Mosaic Viruse-2 on squash zucchini *Cucurbita pepo* L. Master Thesis . College of Agriculture - University of Mosul.

Al-Bayati, K.A.H. (2018). Use of vegetal barriers and yellow traps in the management of potato-borne disease (PVY) transmitted by Aphids insects on the *Solanum tuberosum* L. Bioscience Research, 15(4): 4345-4354.

Al-Bayati, K.A.H. (2019). Management of Zucchini Yellow Mosaic Virus for ZYMV using plant barriers. Plant Archives, 19(2): 3695-3700.

Al-Rawi, Kh.M. and Abdel, A.K.A. (1980). Design and analysis of agricultural experiments. Unv. Mousel.

Anddret-Link, P. and Fuchs, M. (2005). Transmission specificity of plant viruses by vector. Journal of Plant Pathology. 87(3): 153-156.

Asma, N.; Ibtissem, B.F.; Hajer, B.G.; Safaa, G.K. and Arvind, V. (2017). Barley yellow dwarf virus-PAV management using seed-treatment with the insecticide imidacloprid . Arab J. Pl. Prot. 35(3): (2017)

Barnett, F.A. (1990). The yellow plague of cereals Barley Yellow Dwarf Virus. Pages 1-6. In: World Perspectives on Barley Yellow Dwarf. P.A. Barentt(ed) CIMMYT, Mexico, D.F. Mexico.

Clark, M.F. and Adams, A.N. (1977). Characteristics of the Microplate method of Enzyme-Linked Immunosorbent Assay for the detection of plant viruses. J. Gen. Virolo. 34: 475-483.

D'Arry, C.J. (1995). Symptomatology and host rang of Barley Yellow Dwarf Virus. Plant Diseas, 76: 273-276.

El-muadhidi, M.A.; Makkouk, K.M.; Kumari, S.G.; Jarjess, M.M.; Murad, S.M.; Mustafa, R.R. and Tarik, F. (2001). Survey for legume and cereal viruses in Iraq. Psychopathological Mediterranean, 40: 224-233.

Fargette, D.; Lister, R.M. and Oxelfelt, P. (1983). Grasses as a reservoir of barley Yellow Dwarf Virus in ecological complexity. Annual Review Phytopathology, 28L 393-424.

Harlan, J.P. (1979). Barley. In Simmonds NW(eds.) Evolution of crop plant. P.93-98. Longman Ine., New York.

Hassan, A.A. (1991). Production of vegetable crops. The Arab House for Publishing and Distribution. First edition. 710 pages.

Mamluk. O.F.; Haware, M.P.; Makkuok, K.M. and Hnounlok, S.B. (1989). Occurrence,loses and control of important cereal and food legume diseases in West Asia and North Africa .Topical Agriculture Research Series No. 22(Japan); 131-140.

Matthews, H.R. (2002). Plant Virology .Fourth edition. Academic press. London.Uk. 1001 pp.

McKirdy, S.J. and Jones, A.C. (1997). Effect of sowing time on barley yellow dwarf virus infection in wheat : virus incidence and grain yield losses. Australian Journal of Agricultural Research, 48: 199-206.

Miller, W.A.; Liu, S.J. and Beekett, R. (2002). Barley Yellow Dwarf Virus: or *Tombus viridae* ? Molecular plant Pathology. 3 (4): 177-183.

Qasim, Na.A. and Fadhel, Y.A. (2011). Registration of new viruses on wheat and barley crops in Nineveh Governorate. Diyala Journal of Agricultural Sciences, 3(2): 331-344.

Skaf, J.S.; Makkouk, K.M.; Azmeh, F.M. and Al-Kassis, W.F. (1988). Aphid transmission, distribution, and serotyping of barley yellow dwarf virus in Syria. Arab J. of Pl. Prot., 6: 97-105.

Talhouk, A.S. and Makkouk, K.M. (2000). Aphids as pests and vectors of virus diseases affecting Agricultural crops in Lebanon and Syria .Lebanese Science Journal, 1: 123-137.