

**NATURAL HOSTS OF RUSSIAN WHEAT  
APHID, *DIURAPHIS NOXIA* (MORDVILKO)  
(HOMOPTERA: APHIDIDAE), IN THE  
FARS PROVINCE (IRAN) AND A  
PREFERENCE TEST FOR THE GRASSES  
UNDER GREENHOUSE CONDITIONS<sup>1</sup>**

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**ABSTRACT**

Investigation of potential hosts of Russian wheat aphid (RWA) revealed field infestation of twenty gramineous species. Also eighteen gramineous species were susceptible under greenhouse conditions. Preference test showed that triticale, barley, wheat, and wild oat were the most preferred hosts for RWA. There was not any significant difference of preference between triticale, barley, and wheat. However, these hosts were significantly different from other test plants. Other plant species, especially rice, corn, sorghum, and bermudagrass, were less preferred by RWA. Field observations showed that three *Aegilops* species, *Hordeum bulbosum* H., and volunteer wheat may act as a bridge between two consecutive cereal-growing seasons for RWA survival and reproduction.

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## تحقیقات کشاورزی ایران

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میزبان های طبیعی شته روسی گندم (*Diuraphis noxia* (Mordvilko) در استان فارس و آزمایش ترجیح میزبان در بین گونه های گرامینه در شرایط آزمایشگاهی.

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### چکیده

در تحقیقاتی که بر روی میزبان های بالقوه شته روسی گندم انجام گرفت، آلودگی بیست گونه گرامینه مشخص شد. همچنین در شرائط گلخانه، هیجده گونه گرامینه نسبت به شته روسی گندم حساس بودند. آزمایش ترجیح میزبانی نشان داد که شته روسی گندم تریتیکاله، جو، گندم و یولاف وحشی را بیشتر ترجیح می دهد. از نظر ترجیح هیچ تفاوت معنی داری بین تریتیکاله، جو و گندم وجود نداشت، اگرچه سه گونه مزبور از این نظر با سایر گیاهان مورد آزمایش تفاوت معنی داری داشتند. شته روسی گندم سایر گونه های گیاهان، بخصوص برنج، ذرت، سورگوم و مرغ را کمتر ترجیح می دهد. مشاهدات مزرعه ای نشان داد که سه گونه از جنس *Aegilops* و *Hordeum bulbosum* H. و گندم های خودرو به عنوان پلی در بین دو فصل متوالی کشت غلات جهت بقاء و تولید مثل شته روسی گندم عمل می کنند.

## INTRODUCTION

Russian wheat aphid (RWA), *Diuraphis noxia* (Mordvilko), was first reported by Davatchi (7) under *Brachycolus* generic name from Varamin, Isfahan, Sirdjan and Ardekan regions of Iran. It has also been recorded from Shiraz (13), Karadj (12), Yasoodj, Kashan, Arak and different parts of the Fars province (1).

It appears that wheat (*Triticum aestivum* L.) and barley (*Hordeum vulgare* L.) are common hosts of RWA in nearly all of its distributional areas including Iran (7,9,12,13), the former USSR (10), the Middle East (4), and North and South America (8,28). Several reports (3,5,6,14,18,19,23,24,26,27) indicate that RWA also feeds on triticale, rye, corn, oat and several species of *Hordeum*. The overwintering hosts of RWA, volunteer wheat, *Bromus* spp., and *Hordeum murinum* act as bridge between the two consecutive wheat seasons (11,17,27). Kindler and Springer (14) indicated that RWA can survive and reproduce on a broad range of cold- and warm-season grass species.

No extensive investigation has been carried out on RWA host plants in Iran. The purpose of this study was to evaluate RWA host preference in the greenhouse and to identify its natural hosts.

## MATERIALS AND METHODS

Eighteen plant species were evaluated for RWA host preference (Table 1). The seeds were obtained from the Plant Protection Department, Shiraz University and Plant Pests and Diseases Research Institute in Shiraz.

Seeds were planted in the greenhouse in pots (18.5 by 21.0 cm) and thinned to one seedling per pot after germination. All plants received the

Table 1. Mean counts of Russian wheat aphid on 18 gramineous species after a 14-day infestation period.

	Scientific name	Common name	Count		
			$\bar{X}$	$\pm$	SEM
1	<i>X Triticosecale</i> Withmack	Triticale	402.75		301.02
2	<i>Hordeum vulgare</i> L.	Barley	365.50		63.07
3	<i>Triticum aestivum</i> L.	Wheat	198.75		20.65
4	<i>Avena fatua</i> L.	Wild oat	114.25		70.03
5	<i>Agropyron elongatum</i> (Host) P. Beauv.	Tall wheatgrass	81.00		24.31
6	<i>Lolium perenne</i> L.	Perennial ryegrass	59.00		24.72.
7	<i>Secale cereale</i> L.	Rye	58.75		23.92
8	<i>Bromus bibersteinii</i> Tomer & Schultez.	—	56.75		23.12
9	<i>Festuca arundinacea</i> Schreber	Tall Fescue	46.75		12.13
10	<i>Bromus inermis</i> Leysser	Smooth bromegrass	36.75		6.92
11	<i>Phalaris arundinacea</i> L.	Red canarygrass	27.50		11.00
12	<i>Sorghum sudanense</i> (Piper) Stapf	Sudangrass	23.00		7.05
13	<i>Pennisetum americanum</i> (K) K. Schum	Pearl millet	22.00		4.88
14	<i>Dactylis glomerata</i> L.	Orchard grass	15.75		5.22
15	<i>Cynodon dactylon</i> (L.) Pers.	Bermudagrass	8.00		2.58
16	<i>Sorghum bicolor</i> (L.) Moench	Sorghum	7.00		1.96
17	<i>Zea mays</i> L.	Corn	4.50		1.32
18	<i>Oryza sativa</i> L.	Rice	4.25		1.93

same amount of fertilizer, water and light. After 2-4 weeks, when the plants were 12-16 cm, each plant was infested with 10 late-instar RWAs from the laboratory culture. The plants were then covered with plastic cages (13.5 by 16.0 cm) with pieces of cloth covering the top and side ventilation holes. The apterae RWAs were obtained from colonies established from field collections made in Badjgah (Shiraz) in 1991 and maintained on a 2-rowed local barley using rearing procedure described for the greenbug, *Schizaphis graminum* Rondani, by Starks and Burton (21). The infested plants were maintained in the greenhouse at  $23\pm 10^{\circ}\text{C}$  with a 16:8 (L:D) photoperiod. After 14 days, the aphids were removed from the plants and counted. Four replicates (pots) were arranged in a randomized block design. The data were analyzed by ANOVA (2). Means were compared using Duncan's multiple range test ( $P=0.05$ ) (2). Plant species harboring RWA with or without visible damage were also collected and identified.

## RESULTS

### Greenhouse Test

RWA survived on all test plants tested (Table 1), although they failed to maintain their original numbers on rice, corn, sorghum and bermudagrass. Thus these species can not be viewed as suitable hosts for RWA. The greatest reproduction by RWA occurred on triticale, barley and wheat (without significant differences among them), the first two of these hosts showing significantly more RWA reproduction than all other plant species tested except wheat. None of the means of aphid numbers on other hosts differed significantly from one another ( $P=0.05$ ).

The most common visible damages observed in nearly all test plants were leaf rolling, leaf trapping and white streaking. Purple streaking

was only observed in tall wheatgrass and perennial ryegrass. Wild oat and sorghum showed stunting. No visible damage was observed in pearl millet. In nearly all hosts, RWA was frequently found at the base of rolled leaves. In high population densities, however, it was also found on all aerial parts of the plants, even beneath the leaves.

#### Field Collections

Twenty gramineous plant species were identified as RWA hosts (Table 2). Field observation on relative abundance of the aphid on these hosts revealed that three *Aegilops* species in Badjgah and *Hordeum bulbosum* in Badjgah and Yasoodj harbored relatively higher populations. No RWA was observed on plants other than Graminae.

### DISCUSSION

Field collections and greenhouse study on RWA host range indicated that wheat, barley and triticale are its best hosts. This result agrees with that of Walters *et al.* (25). Based on greenhouse results *Avena fatua* L. was one of the best host plants. Our field observations indicated that *A. sativa* L. and *A. fatua* L. were not seriously damaged by the aphid, and only few RWAs were found on them. The reports of Walters *et al.* (25) and Stern and Orloff (22) are similar to that of our field observation on *A. fatua*. Rice, corn, sorghum and bermudagrass harbored only few RWA in the greenhouse test as Webster *et al.* (27) have also mentioned. In the field, only few aphids were found on bermudagrass and none on rice, corn and sorghum. The number of RWAs on tall fescue were fewer than on tall wheatgrass as Clement *et al.* (6) and Kindler *et al.* (15) had previously mentioned.

Table 2. RWA host plants collected in different parts of the Fars province.

**Scientific name**

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*Aegilops crass* Boiss. var. *crassa*  
*A. tauschii* Coss  
*A. triuncialis* L.  
*Avena sativa* L.  
*A. fatua* L.  
*A. ludoviciana* Duriew  
*Alopecurus myosuroides* Hudson  
*Bromus danthoniae* Trin  
*Digitaria sanguinalis* (L.) Scop  
*Echinochloa crus-galli* (L.) P. Beauv.  
var. *submultica* Neiler  
*Hordeum vulgare* L.  
*H. bulbosum* H.  
*H. glaucum* Steud  
*Lolium persicum* Boiss. Hohen  
*Phalaris minor* (Retz)  
*Setaria viridis* (L.) P. Beauv  
*Secale cereale* L.  
X *Triticosecale* Wittmack  
*Triticum aestivum* L.  
*Cynodon dactylon* (L.) Pers.

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High levels of aphid population with little or no parasitization by aphelinids and aphidiids were observed on three *Aegilops* species in Badjgah and *Hordeum bulbosum* H. in Badjgah and Yassodj. It seems that these are the best overwintering hosts of RWA. The factors keeping RWA parasitoids away from RWA on these plants should be investigated. Other RWA hosts with a few aphids and no parasitization were *Setaria viridis* (L.) P. Beauv., *Lolium persicum* Boiss. Hohen., *Avena ludoviciana* Durieu, and *Bromus danthoniae* Trin. Great number of RWA with a high level of parasitization were found on *Hordeum glaucum* Steud. and volunteer wheat. It appears that the three *Aegilops* species, *Hordeum bulbosum* and volunteer wheat serve as a bridge between two consecutive cereal-growing seasons. Hewitt *et al.* (11), Mokrzecki (16) and Walters *et al.* (25) have considered volunteer wheat as RWA overwintering host.

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