Study of competition among wild oat (*Avena fatua*) and triticale lines

Majid Najjari Sadeghi*, Bahram Mirshekari, Amirhoushang Hosseinzadeh Moghbeli, Sahar Baser Kouchehbagh

Assistant Professor, Department of Agronomy and Plant Breeding, Tabriz Branch, Islamic Azad University, Tabriz, Iran. *Corresponding author: Mnajjari@iaut.ac.ir

Abstract: A factorially field experiment was carried out at the Research Station of Islamic Azad University, Tabriz Branch, in a randomized complete block design with 3 replications. Treatments were 6 wild oat densities (0, 6, 12, 18, 24 and 30 plants per meter row) and 19 triticale lines (Dahbi 6, Susi 2, Bat 3, Coati 1, Tapir 1, Pollmer 3, Ardi 1, Erizo 10, Mah 10947, CTY 88, Eronga 83, Presto 2, Beagle 1, Fahad 5, Bull 10, X21295-159, Tesmo 1, Anoas 5,Poppi 2). In Hexaploid lines of triticale thousand seed weight ranged from 51 g in weed free plot up to 33 g in plots with the highest weed density. Yielding ability of triticale at interference with 6 and 12 weed plants per meter row was same as control. Higher weed densities was more effective than lower densities on grain yield. In octaploid lines of triticale tiller number per plant in weed free condition were 4, but when triticale grew along with 6, 12 and 18 wild oat plants per meter row reduced up to 3 and in 24 and 30 weed plants per meter row reduced up to 2. Biological yield of triticale ranged from 0.88 g m^{-2} in 24 and 30 weed plants per meter row up to 1.34 g m^{-2} in 0, 6 and 12 plants per meter row. Economical yield threshold in triticale lines was started when wild oat density exceed from 12 weed plants per meter crop row.

[Majid Najjari Sadeghi, Bahram Mirshekari, Amirhoushang Hosseinzadeh Moghbeli, Sahar Baser Kouchehbagh. **Study of competition among wild oat (*Avena fatua*) and triticale lines.** *Life Sci J* 2013;10(5s):457-459] (ISSN:1097-8135). http://www.lifesciencesite.com. 79

Key words: Economical yield threshold, wild oat densities, thousand seed weight.

1. Introduction

Weeds compete with crop plants for environmental resources like nutrients, water and light (Mortimer, 1997). They, thus, significantly reduce crop yield, impair crop quality and bring about substantial financial loss to the farmer. On a global basis, weeds are considered to be responsible for about 10% reduction of crop yield (Froud-Williams, 2002). Triticale (Triticosecale) is a hybrid of wheat (Triticum) and rye (Secale) first bred in laboratories during the late 19th century. Triticale is a semi-important cereal and staple food crop in Iran (Karimi, 2008), and is estimated to increasing its cultivation area up to 500×103 ha (Zargi et al., 2009). Weeds are a serious menace to its production, then not only reduce quantity of the crop, but also hinder in harvesting and deteriorate its quality (Thomas, 2002; Abd-Elwahab and Riaz, 2000). Avena fatua is a species of grasses in the oat genus, which is known as common wild oat. Few wild oat plants may cause a significant reduction in wheat yield. Seedlings of Avena fatua are identical to wheat seedlings in appearance in addition to its life cycle which is also closely linked with that of wheat. It is highly competitive and causes severe reduction in yield which may range from 10 to 73% in different crops (Tiwari et al., 1998). It has also been reported that even two plants per meter row of hairy nightshade (*Solanum sarrachoides*) reduced dry bean yield up to 13% (Blackshaw, 1991). This study was planned to evaluate the effects of wild oat interference in triticale cultivars.

2. Materials and Methods

A field experiment was carried out at the Research Station of Islamic Azad University, Tabriz Branch, located in north-west of Iran. The climate is semi-arid and cold with an average annual precipitation of 270 mm. Fertilizers applied based on soil analysis were 80 kg ha^{-1} of urea and the same rate from ammonium phosphate and 25 kg ha^{-1} of potassium sulfate. Plots were arranged factorially in a randomized complete block design with 3 replications. Treatments were 6 wild oat densities (0, 6, 12, 18, 24 and 30 plants per meter row) and 19 triticale lines (Dahbi 6, Susi 2, Bat 3, Coati 1, Tapir 1, Pollmer 3, Ardi 1, Erizo 10, Mah 10947, CTY 88, Eronga 83, Presto 2, Beagle 1, Fahad 5, Bull 10, X21295-159, Tesmo 1, Anoas 5,Poppi 2). Statistical analysis of data was done by using MSTAT–C software with mean comparison by Duncan's multiple range tests in the 5% probability level.

3. Results and Discussion

In the experiment only Fahad 5 and Bull 10 triticale lines completed flowering stage, and revealed that these two lines were hexaploid as grain triticale, and other lines were octaploid as forage triticale. Therefore variance analysis was conducted in 2 and 17 lines separately. Effect of different wild oat densities on 1000 seeds weight and grain yield of hexaploid lines were significant at $P<0.01$ (Table 1). Also, tiller number per plant and biologic yield in octaploid lines were affected by weed density (Table 2).

Table 1: Variance analysis of triticale lines at interference with wild oat densities

	Hexaploid lines of triticale			Octaploid lines of triticale		
SV	df	1000 seeds weight	Seed Yield	df	Tiller number per plant	Biologic yield
Replicate	2	58.22	525.52**	2	0.01	80.95
Line	1	99.55	122.19	16	10.10	46.55
Density	5	298.52**	599.78**	5	168.43**	500.50**
Line×Density	5	87.11	23.00	80	74.44	80.19
Error	22	60.32	100.10	202	43.56	80.80
CV (%)	-	20.00	18.03	-	16.56	10.10

** indicates significant at 1% probability level. SV, df and CV mean source of variations, degree of freedom and coefficient of variations, respectively.

3.1. Hexaploid lines of triticale

Thousand seed weight (TSW) of triticale ranged from 51 g in weed free plot up to 33 g in plots with the highest weed density. TSW with increasing of weed density experienced a reducing trend. The crop plant could tolerate 6 weeds per meter row without any significant reduction in TSW. In range of studied wild oat densities TSW decreased 0.6 g per weed (Fig. 1). Irawati et al., 2003 in an experiment on soybean (*Glycine max*) understood that when redroot pigweed (*Amaranthus retroflexus*) density increased from 2 to 10 plants pot^{-1}, crop TSW reduced from 129 g to 102 g and from 121 g to 105 g in Melrose and Banjalong varieties, respectively. This is in agreement with those reported by Mickelson and Harvey (Mickelson and Harvey, 1999) in corn-lambsquarters (*Chenopodium album*) competition. Grain yield of triticale lines reduced significantly due to weed interference. Inter-specific competition of 30 wild oat plants per meter row with triticale leads to yield reduction from 0.6 g m^{-2} in control to 0.4 g m^{-2}. Mean comparisons revealed that yielding ability of triticale at interference with 6 and 12 weed plants per meter row was same as control (Fig. 2). Higher wild oat densities was more effective than lower densities on grain yield. In Carlson and Hill, 1985 experiment, increasing of johnsongrass (*Sorghum halepense*) density as a noxious weed in corn field caused to yield reduction of from 8.5% to 46.6%. In the present study, with consideration of yield loss values in studied treatments compared to the control, economical yield threshold in hexaploid lines of triticale was started when wild oat density exceed from 12 weed plants per meter crop row.

3.2. Octaploid lines of triticale

All of the triticale lines indicated same response to the weed interference. Tiller number per crop plant in weed free conditions was 4, but when triticale grew along with 6, 12 and 18 wild oat plants per meter row reduced up to 3 and in 24 and 30 weed plants per meter row reduced up to 2 (Fig. 3). Biological yield of triticale ranged from 0.88 g m^{-2} in 24 and 30 weed plants per meter row up to 1.34 g m^{-2} in 0, 6 and 12 plants per meter row (Fig. 4). This is supported by reports of Carlson and Hill, 1985 on wheat.

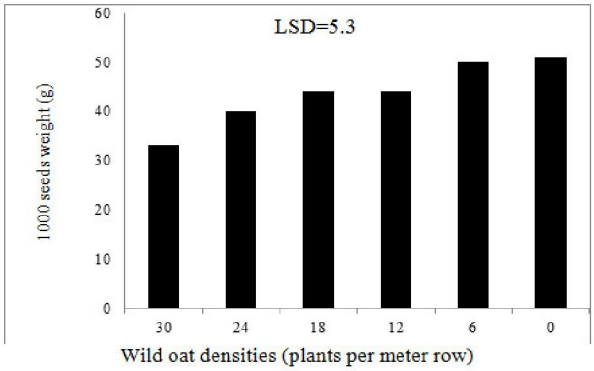

Figure 1: Effect of wild oat densities on 1000 seeds weight of hexaploid lines.

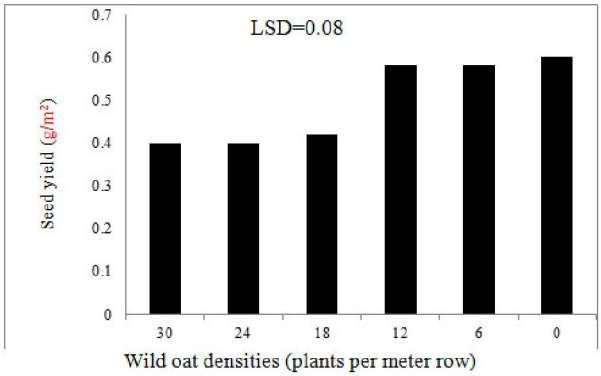

Figure 2: Effect of wild oat densities on seed yield of hexaploid lines.

Economical yield threshold of wild oat in forage lines of triticale is beginning when weed density exceeds more than 12 plants per meter row. Weeds populations and response of triticale lines to weed competition is same as wheat. Storkey et al., 2003 reported that when 2 winter wheat cultivars competed with *Alopecurus myosuroides* as a troublesome weed in wheat fields biomass and grain yield of both cultivars decreased 22% and 18%, as compared to non-weedy treatment.

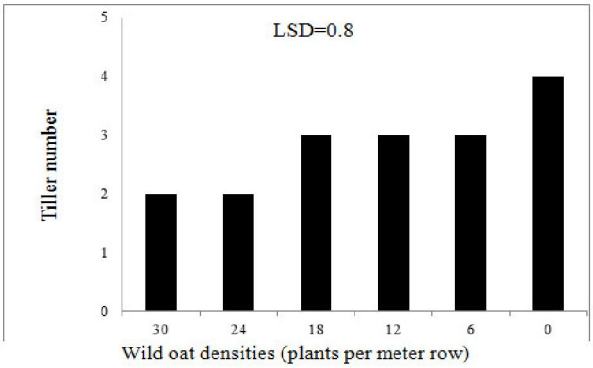

Figure 3: Effect of wild oat densities on tiller number per plant of octaploid lines.

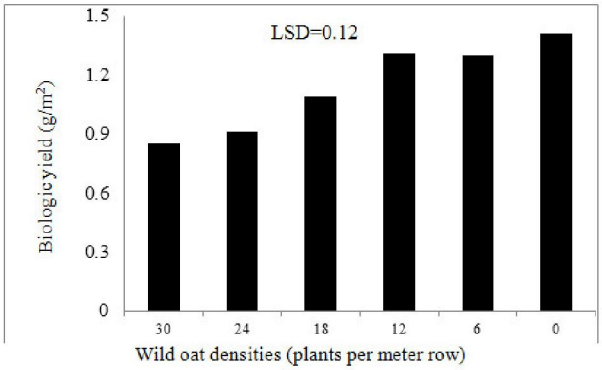

Figure 4: Effect of wild oat densities on biologic yield of octaploid lines.

4. Conclusion

Economical yield loss threshold in all lines of triticale was started when wild oat density exceed from 12 weed plants per meter crop row.

Acknowledgements:

The authors wish to thank Islamic Azad University, Tabriz Branch, for financial support and providing field facilities in conducting this study. We are also grateful to Prof. Dr. Hamdollah Kazemi Arbat, from Department of Agronomy, University of Tabriz, for his valuable contributions and reviewing of the manuscript.

3/7/2013

References

1. Abd-Elwahab A, Riaz B. Troublesome weeds in triticale. Egyptian J Agric 2000;4:28-32.
2. Blackshaw RE. Hairy nightshade (*Solanum sarrachoides*) interference in dry beans (*Phaseolus vulgaris*). Weed Sci 1991;39:48-53.
3. Carlson HL, Hill JE. Wild oat (*Avena fatua*) competition with spring wheat. In: Plant density effect. Weed Sci 1985;33:176-181.
4. Froud-Williams RJ. Weed competition. In weed management handbook. In: Naylor REL (Ed.). Blackwells 2002;pp:16-38.
5. Ghosheh HZ, Holshouser DL, Chandler JM. The critical period of johnsongrass (*Sorghum halepense*) control in field corn (*Zea mays*). Weed Sci 1996;44:944-947.
6. Irawati C, Acram T, Robin J. Weed interference in soybean (*Glycine max* L.). Proc of 11th Aust Agro Conf Geelong 2003;pp:124-125.
7. Karimi H. Wheat. Tehran University Publication 2008;pp:599.
8. Mickelson JA, Harvey RG. Effect of *Eriochloa villosa* density and time of emergence on growth and seed production in *Zea mays*. Weed Sci 1999;47:687-692.
9. Mortimer M. The need for studies on weed ecology to improve weed management, Expert consultation on weed ecology and management. FAO Report 1997;pp:15.
10. Storkey J, Cussans JW, Lutman PJ, Blair AM. The combination of a simulation and an empirical model of crop-weed competition to estimate yield loss from *Alopecurus myosuroides* L. in winter wheat. Field Crop Res 2003;94:291-301.
11. Thomas PEL. Weed competition in wheat, PANSF Publication 2002;pp:198.
12. Tiwari RN, Tiwari KP, Thakur BS. Comparative efficiency and economics of weed control in soybean. Indian J Weed Sci 1998;20(4):7-11.
13. Zargi H, Gelian A, Kermanshahi H, Aghel H. Study effect of cultivar, region and enzyme on quality of triticale. Iranian J Poultry Sci 2009;41(4):309-321.