

Investigation of Plant Density and Weed Competition in Different Cultivars of Wheat In Khoramabad Region

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Abstract—In order to study the effect of plant density and competition of wheat with field bindweed (*Convolvulus arvensis*) on yield and agronomical properties of wheat (*Triticum Sativum*) in irrigated conditions, a factorial experiment as the base of complete randomized block design in three replication was conducted at the field of Kamalvand in Khoramabad (Lorestan) region of Iran during 2008-2009. Three plant density (Factor A=200, 230 and 260kg/ha) three cultivar (Factor B=Bahar, Pishtaz and Alvand) and weed control (Factor C= control and no control of weeds) were assigned in experiment. Results show that: Plant density had significant effect (statistically) on seed yield, 1000 seed weight, weed density and dry weight of weeds, seed yield and harvest index had been meaningful effect for cultivars. The interaction between plant density and cultivars for weed density, seed yield, thousand seed weight and harvest index were significant. 260 kg/ha (plant density) of wheat had more effect on increasing of seed yield in Bahar cultivar wheat in Khoramabad region of Iran.

Keywords—*Convolvulus arvensis*, plant density, *Triticum sativum*, weed density, Wheat

I. INTRODUCTION

WHEAT (*Triticum sativum*) is a more important crop in Iran and contains 6.8 million hectares of cultivated land. Approximately 34 % of wheat land has been irrigated. Therefore with attention to crop intensive, recognition of agro techniques agents is important step to increase yield and yield component of wheat [2]. Weeds are unwished plants in places that not expectations and reduced production and quality of crops, or disturb landscape [1]-[2]. Most of half farmers attempts consumed to weed control with different methods. Murphy observed that planting pattern and distance between row differ plant density and decrease dry matter of weed [4]. optimum competition and crop production consume with suitable plant density and decrease application of herbicide in farm to avoiding wild life pollution. Suitable plant density increase economic yield and prevent from growth of other plant (specially noxious weed) in farm and lead to high seed yield in cereals [3]. Field bindweed (*Convolvulus arvensis* L) is one of 10 noxious weeds in world that destructs wheat and summer crops.

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Field been is perennial with strong root system that growths from primary of spring to fall. High density of field bindweed decrease 50-60 percent of crop [6]-[9]. Zand said that field been weed controlled with suitable plant density in wheat land of Iran. So researches in irrigated crop in relation with plant density and weed control is essential especially in cereals in Iran [7].

II. METHODS

Experiment conducted at field of kamalvand region of Khoramabad Lorestan during 2008-2009 with temperate climate & warm summer. Effective rain fall is beginning from November to May (total rain fall during 2008-2009 in kamalvand region = 658/1 mm /year, mean of rain fall = 500 mm/year and number of dry month = 5). After land preparation, a Factorial experiment as the base of complete randomized block design with three replication (table 1) applied. Three plant density (Factor A=200, 230 and 260kg/ha) and three cultivar (Factor B=Bahar, Pishtaz and Alvand) were assigned in experiment (table 1). Chemical fertilizer consume as base of soil analysis test from urea and Di ammonium phosphate resource. Nitrogen consummated at two time (sowing & jointing stage). Seed of cultivars prepared from Lorestan agricultural research center. Seeds of Field been weed (*Convolvulus arvensis* L) distribute in all plots of experiment with spot method. After physiological ripening, borders omitted and seed yield, Harvest index, 1000 seed weight, Dry weight of weeds (per m²) and weed density (*Convolvulus arvensis* L) per square meter measured. MSTATE software program used for analysis of variance and Duncan's test applied for comparison of means.

III. RESULTS

Plant density and the interaction between cultivar and weed and cultivar, plant density and weed had significant effect on thousand weight (table 2) and D3 (260 kg/ha) produced the highest thousand weight than other treatments (55.1g). Bahar produce the highest thousand weight than other treatment (48.9g). Bahar with 260 kg/ha and complete control of weed (D3C1W1) produced the highest thousand weight and Alvand with 200 kg/ha plant density and no control of weed (D1C3W2) produced the lowest weight of seed. Also Bahar was superior (in complete weed control and no control of weed. Good and correct management of weed (specially noxious weed) and suitable plant density improve soil fertility, Water efficiency and plant nutrition which lead to high yield and yield component in cereal farming [6]-[4]- [3]. Thousand

weights depend on genetically properties, sink competition, duration of seed filling and environmental condition (before and after pollination). Thousand weights is one of the most important yield components in cereals. Correct adjustment of Plant density and weed management improved yield component in cereal. Also suitable cultivar increased seed production in bread wheat [6]. Plant density, cultivar, weed and the interaction between treatments had significant effect on harvest index (table 3) and D2 (230 kg/ha) produced the highest HI than other treatments (44%). Interaction effects between cultivars and density and weed were significant (table 3). Pishtaz with 260 kg/ha and complete control of weed (D3C3W1) produced the highest harvest index. And Bahar with 200 kg/ha and no control of weed (D1C1W2) produced the lowest harvest index. Also pishtaz produce the highest HI (in control and no control of weed) than other treatments. High harvest index indicates suitable seed yield (economic yield) in wheat. High seed yield causes suitable harvest index. In addition suitable plant density increase economic yield and prevent from growth of other plant (weed specially noxious weed) in farm and lead to high seed yield [3]. Plant density, cultivar and the interaction between cultivar and plant density, cultivar and weed had significant effect on seed yield (table 3) and D3 (260 kg/ha) produced the highest seed yield than other treatments (6843 kg/ha). Bahar produce the highest seed yield than other treatment. (6510 kg/ha). Bahar with 260 kg/ha and complete control of weed (D3C1W1) produced the highest seed yield and alvand with 200 kg/ha (D1C3) produced the lowest seed yield. Also Bahar produce the highest seed (in complete weed control) and no control of weed in alvand lead to lowest seed production. Good and correct management of weed (specially noxious weed) suitable plant density improve soil fertility. Water efficiency and plant nutrition which lead to high yield in cereal [5] -[6]-[4]- [3]. Plant density, weed, cultivar and the interaction between cultivar, plant density and weed had significant effect on dry weight of weed (table 3) Highest dry weight of weed produced in 200 kg/ha plant density (482 g/m²). High plant density (D3) increases potential of wheat cultivar in competition with weeds, as a result Weed weight decreases in canopy. Also no control of weeds produced the highest dry weight of weed (1280 g/m²). Bahar with 260 kg/ha and complete control of weed (D3C1W1) produced the highest seed yield and alvand with 200 kg/ha (D1C3) produced the lowest seed yield. Also Bahar produce the highest seed (in complete weed control) and no control of weed in alvand lead to lowest seed production. In this research high plant density (D3) decrease dry weight of weed (specially noxious weed) and improve competition potential of wheat for consuming light, water and minerals which lead to high seed yield in wheat [7]- [3]. Plant density and the interaction between cultivar, plant density and weed had significant effect on weed density (table 2). Highest weed density produced in 200 kg/ha plant density (17.3 plants per m²). High plant density (D3) increases potential of wheat cultivar in competition with weeds, as a result Weed density (*Convolvulus arvensis* L) decreases in canopy of wheat. High density of field bind weed (*Convolvulus arvensis* L) decrease

50-60 percent of crop [6]-[9]. Also control of weed produce the lowest weed density in all cultivars. No control of weed and 200 kg/ha plant density (D1) increase density of weed. Also high weed density observe in Bahar cultivar (27.3) and alvand was superior for decreasing weed density (8.9 plants per m²). Suitable cultivar had important effect on control of weed in cereal farming of Iran [7]-[9].

TABLE I
LEVELS OF TREATMENTS

weed	Plant density (kg/ha)	Cultivar
W1= control	200	Bahar
W2= no control	230	Pishtaz
(Replication=3)	260	Alvand

TABLE II
ANALYSIS OF VARIANCE

Source of variation	Degree of freedom	Weed density	Thousand weight
block	2	0.241	86.519
Cultivar	2	0.519 ^{ns}	3.907 ^{ns}
Plant density	2	1560.5**	802.3**
cultivar×plant density	4	2.991. *	12.63*
weed	1	14504**	16.667 ^{ns}
weed×cultivar	2	0.667 ^{ns}	3.722 *
weed×plant density	2	1577 **	20.056 ^{ns}
Cultivar×weed×plant density	4	3.639*	5.611**
Experimental error	34	1.633	15.95
Total	53		
Coefficient of variation	-	15.33	18.25

Ns, **, *: non significant, significant at the 1% and 0.5% levels of probability respectively

TABLE III
ANALYSIS OF VARIANCE

Source of variation	Seed yield	Dry weight of weed	Harvest index
block	28016	266.79	2.942
Cultivar	387216.6**	182.3 ^{ns}	91.90**
Plant density	3581816.**	433356**	73.73**
cultivar×plant density	413666.6**	121.6 ^{ns}	19.49**
weed	156816.6 ^{ns}	1225891**	6.962 ^{ns}
weed×cultivar	4316.66*	202.463*	0.916 ^{ns}
weed×plant density	27016 ^{ns}	344740.0**	13.813**
Cultivar×weed×plant density	24366 ^{ns}	141.574*	3.595 ^{ns}
Experimental error	17075	1243.953	1.793
Total			
Coefficient of variation	12.04	17.37	13.23

Ns, **, *: non significant, significant at the 1% and 0.5% levels of probability respectively

IV.CONCLUSION

Researches about plant density and cultivar are essential especially in cereals. Cereal farming productions inhibit with noxious weed. Bread wheat (*Triticum sativum*) has high potential to increase productions of cereal in Iran. Researches about wheat showed that weed control management had significant effects on yield and yield components of bread wheat. Field bean weed (*Convolvulus arvensis* L) is one of 10 noxious weeds in world that destructs wheat and summer crops. High density of field bind weed decrease 50-60 percent of crop. In this study, density levels had significant effect on, thousand weight, seed yield, harvest index, weed density (*Convolvulus arvensis* L) and dry weight of weed. Also cultivar had significant effect on seed yield and harvest index and Bahar was superior for seed yield. So Bahar had good responses to weed control management plant density and environmental factors. The interaction between plant density & cultivar for thousand weights, weed density, seed yield and harvest index were significant. So high plant density (260 kg/ha) increased yield and yield component and suitable for weed control in wheat farming. Good and correct plant density, suitable cultivar and management of weed (noxious weed) improve soil fertility, minerals, light and available water which lead to high yield and yield component in bread wheat [7] -[3]-[6]- [8] -[2] -[5].

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