International Journal of Agricultural Sciences
Volume 13 | Issue 2 | June, 2017 | 378-384 ■ e ISSN-0976-5670
DOI:10.15740/HAS/IJAS/13.2/378-384
Visit us : *www.researchjournal.co.in*

RESEARCH PAPER

Evaluation of growth, yield attributing characters, yield and economics of wheat (*Triticum aestivum* L.) in integrated weed management practice under the temperate conditions of Kashmir

RAYEES A. SHAH
National Agricultural Innovation Project, SRLS-3, KUPWARA (J&K) INDIA

Abstract : A field experiment was conducted under the temperate conditions of Kashmir during *Rabi* season 2011-12 and 2012-13 to study the effect of integrated weed management on growth, yield attributing characters, yield and economics of wheat (*Triticum aestivum* L.). The results revealed significant increase in grain yield and growth characters, like crop emergence/mm row length, No. of tillers / m row length at 60 DAS and plant height (cm) at 60 DAS with isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing during both the years. Among the weed control measures isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing recorded higher grains/ear, 1000 grain weight (g), highest grain yield (4.22 tonnes/ha) as well as straw yield (6.10 tonnes/ha) which was at par with the weed free but; isoproturon @ 1 kg a. i /ha tank mix with 2, 4-D @ 0.5kg a. i /ha at 32 days after gives significantly highest net returns Rs. 817.7 and Rs. 919.7 during 2011-12 and 2012-13, respectively. The higher net returns under isoproturon @ 1 kg a. i /ha tank mix with 2, 4-D @ 0.5kg a. i /ha at 32 days after sowing was due to lower cost of herbicides.

Key Words : Wheat, Herbicides, Integrated weed management, Yield

View Point Article : Shah, Rayees A. (2017). Evaluation of growth, yield attributing characters, yield and economics of wheat (*Triticum aestivum* L.) in integrated weed management practice under the temperate conditions of Kashmir. *Internat. J. agric. Sci.*, **13** (2) : 378-384, **DOI:10.15740/HAS/IJAS/13.2/378-384.**

Article History : Received : 09.03.2017**; Revised :** 05.05.2017**; Accepted :** 19.05.2017

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the second most important food crop of the country, which contributes nearly one-third of the total foodgrains production (Economic Survey, 2007) and thus, occupies an important position in total food-grain production in the country. This contribution has increased over years and was less than 10 per cent in the early fifties. However, harvesting of large tonnage of yield year after year has lead a number of problems like deficiency of plant nutrients in soils were adequate nutrients are replenishments, encourages weed infestation in the field as repeated wheat culture increases wild oats and phalaris infestation. Weeds are one of the important factors responsible for low yield of wheat in our country which is responsible for reducing crop growth by two mechanisms, *i.e.* competition for resources, such as space, light, water, nutrients etc. (Upadhyay, 1984) and by allellopathic effect (Bansal, 1993). Besides these, weeds also act as host for causal

organisms of various diseases and insect pests. Keeping weeds under controls is very crucial for achieving high yield levels. Since the initial growth of the crop is slow maximum damage is caused by weeds during early growth stages due to weed wheat competition. Several methods are available for their control including hand-held equipment, *viz.*, *Khurpi*, hand hoe etc, power driven implements, *viz.*, cultivaters and chemical weedicides. Use of chemical weedicides has become quite prevalent in several parts of the country, since it is economical, effective and enables timely control of weeds but always use of herbicides is not feasible due to some unavoidable circumstances like unavailability of proper herbicides and cropping system requirement etc. therefore, it is necessary to explore and test other alternative and economical methods of weed control. In view of these facts study on weed management practices was carried out for identifying effective and economically viable weed control method for harvesting higher yields of wheat crop.

MATERIAL AND METHODS

The experiment was carried out in wheat cultivation at the demonstration plot, adopted under National Agricultural Innovation Project-3 SRLS at actual line of control between India and Pakistan Occupied Kashmir (ALC); in Teethwal block of Tangdhar cluster (34.5^{0}N latitude and 74.5^{0}E longitude 2658 m above msl) of district Kupwara, Jammu and Kashmir, during *Rabi* season 2011-12 and 2012-13. The initial soil status was medium in organic carbon (0.90), available N (345 kg/ha), available P (20 kg/ha) and available K (160 kg/ha) and was neutral in reaction (pH 7.9). The experiment comprised 10 treatments, namely (1) T_1: Weed check, (2) T_2: Hand weeding at 30 days after sowing, (3) T_3: 2, 4-D Na salt @ 625g a. i /ha at 35 days after sowing, (4) T_4: Isoproturon @ 1 kg a. i /ha at 32 days after sowing, (5) T_5: Sulfosulfuron @ 45g a. i /ha at 35 days after sowing, (6) T_6: 2, 4-D Na salt @ 625g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing, (7) T_7: Isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing, (8) T_8: Sulfosulfuron @ 45g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing, (9) T_9: Isoproturon @ 1 kg a. i /ha tank mix with 2, 4-D @ 0.5kg a. i /ha at 32 days after sowing (10) T_{10}: Weed free. The experiment was laid out in Randomized Block Design with 3 replications. All the cultural/agronomic practices were adopted as per recommendations but weed control practices were applied as per the treatments. The crop was evaluated in terms of growth, yield attributing characters, yield and economics, net returns and benefit: cost ratio of wheat cultivation. Weed control efficiency (WCE) and weed index (WI) was calculated as per standard formula.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Effect on growth :

Among the weed control measures, weed check recorded significantly lowest crop emergence/mm row length (43.3) than the rest of the treatments during both the years. Similar findings were reported by Kumar and Walia (2003). Weed free recorded highest values of crop emergence/mm row length (55.6) followed by Isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing. Significant number of tillers / m row length at 60 DAS and plant height (cm) at 60 DAS of crop was recorded in weed free recorded highest values of crop emergence/mm row length (55.6) followed by Isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing (Table 1) because of less total weed density, dry matter accumulation and crop weed competition. Table 1 revealed that besides weed-free treatment highest plant height (40 cm) was obtained with isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing and was at par with sulfosulfuron @ 45g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing, followed by 2, 4-D Na salt @ 625g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing and isoproturon @ 1 kg a. i /ha tank mix with 2, 4-D @ 0.5kg a. i /ha at 32 days after sowing. The lowest plant growth-attributing characters were obtained in weedy check. Similar were the findings of Meena and Chaudhary (2007).

Effect on yield-attributing characters :

All the weed management practices significantly influenced the yield attributes of wheat over unweeded treatment (Table 2a). Significantly more number of productive tillers/m^2, ear length (cm) were obtained with weed-free treatment being at par with sulfosulfuron @ 45g a. i /ha at 35 days after sowing + hand weeding at

30 days after sowing followed by, isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing. The lowest yield-attributing characters were obtained in weedy check. More numbers of yield attributes of wheat in weed control treatments was due to the vigorous crop growth and more leaf area index in the treated plots than the weedy check treatment which revealed the extent of loss caused by the presence of weeds in wheat, if unchecked. This is in agreement with the findings of Sharma and Chauhan (1995). Weedy check recorded higher percentage of light interception than the other weed control treatment during both the years. With depth in plant canopy the radiation load decreased downward due to shading much more so in a weedy check treatment which block light penetration. Increased light interception has also been reported by Singh *et al*. (2007).

Effect on yield :

Isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing recorded higher grains/ear and 1000 grain weight (g) which was at par with the weed free and significantly higher than weed check and was due to more development of reproductive structures (Table 2b). Tripathi *et al*. (2005) and Gopinath and Kundu (2008) also reported the similar findings. Besides, Table 3 revealed that; weed-free treatment, isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing gave significantly the highest grain yield (4.30 and 4.22 tonnes/ha, respectively) and straw yield (6.25 and 6.10 tonnes/ha, respectively), followed by sulfosulfuron @ 45g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing which yielded 4.18 and 5.94 tonnes /ha of grain and straw, repectively. Weed check recorded significantly lowest grain yield (3.60 tonnes/ha), straw yield (5.22 tonnes/ha) than rest of the weed control treatments and was due to more weed dry matter accumulation, weed density, higher degree of crop weed competition and less crop dry weight (Table 3). This shows that a major share of nutrients was saved for the benefit of crop by reducing crop weed competition in integrated weed management

Table 1: Evaluation of wheat growth in integrated weed management practices (pooled data of 2 years)

Treatments		Wheat growth			
		Crop emergence/mm row length	No. of tillers / m row length at 60 DAS	Plant height (cm) at 60 DAS	2010-11
T_1	weed check	43.3	115	36.7	371
T_2	Hand weeding at 30 days after sowing	46.3	114	36.7	475
T_3	2, 4-D Na salt @ 625g a. i /ha at 35 days after sowing	47.0	116	38.3	472
T_4	Isoproturon @ 1 kg a. i /ha at 32 days after sowing	47.3	117	39.0	478
T_5	Sulfosulfuron @ 45g a. i /ha at 35 days after sowing	47.7	118	39.0	485
T_6	2, 4-D Na salt @ 625g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing	51.3	120	39.3	477
T_7	Isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing	54.0	121	40.0	480
T_8	Sulfosulfuron @ 45g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing	53.0	121	40.0	481
T_9	Isoproturon @ 1 kg a. i /ha tank mix with 2, 4-D @ 0.5kg a. i /ha at 32 days after sowing	50.7	119	39.3	490
T_{10}	Weed free	55.6	125	42.0	477
					478
					483
					484
					472
					487
					14.97
	C.D. (P=0.05)	3.2	3.2	3.0	NS

NS= Non-significant

Table 2a: Evaluation yield attributes of wheat in integrated weed management practices (pooled data of 2 years)

Treatments		Yield attributes of wheat			
		Productive tillers/m^2	Ear length (cm)	No. of spiklete/ear	2010-11
T_1	Weed check	248	11.0	12.7	371
T_2	Hand weeding at 30 days after sowing	252	11.5	12.8	475
T_3	2, 4-D Na salt @ 625g a. i /ha at 35 days after sowing	258	11.6	13	472
T_4	Isoproturon @ 1 kg a. i /ha at 32 days after sowing	261	11.7	13.2	478
T_5	Sulfosulfuron @ 45g a. i /ha at 35 days after sowing	264	11.8	13.3	485
T_6	2, 4-D Na salt @ 625g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing	280	12.0	13.3	477
T_7	Isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing	296	12.2	14.0	480
T_8	Sulfosulfuron @ 45g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing	298	12.2	13.7	481
T_9	Isoproturon @ 1 kg a. i /ha tank mix with 2, 4-D @ 0.5kg a. i /ha at 32 days after sowing	256	11.8	13.3	490
T_{10}	weed free	310	12.8	14.1	477
					478
					483
					484
					472
					487
					14.97
	C.D. (P=0.05)	6.0	0.8	0.8	NS

NS= Non-significant

Table 2b: Evaluation yield attributes of wheat in integrated weed management practices (pooled data of 2 years)

Treatments		Yield attributes of wheat		
		Grains / ear	1000-grain weight (g)	2010-11
T_1	Weed check	50.7	43.0	371
T_2	Hand weeding at 30 days after sowing	45.8	42.8	475
T_3	2, 4-D Na salt @ 625g a. i /ha at 35 days after sowing	46.2	43.7	472
T_4	Isoproturon @ 1 kg a. i /ha at 32 days after sowing	46.4	42.9	478
T_5	Sulfosulfuron @ 45g a. i /ha at 35 days after sowing	45.8	42.8	485
T_6	2, 4-D Na salt @ 625g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing	46.4	43.8	477
T_7	Isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing	49.0	44.0	480
T_8	Sulfosulfuron @ 45g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing	48.4	43.0	481
T_9	Isoproturon @ 1 kg a. i /ha tank mix with 2, 4-D @ 0.5kg a. i /ha at 32 days after sowing	47.8	43.2	490
T_{10}	weed free	50.7	44.2	477
				478
				483
				484
				472
				487
				14.97
	C.D. (P=0.05)	2.8	NS	NS

NS= Non-significant

Table 3: Evaluation yield of wheat in integrated weed management practices (pooled data of 2 years)

Treatments		yield of wheat			
		Grain yield (tonnes/ha)	Straw yield (tonnes/ha)	Harvest index (%)	2010-11
T_1	Weed check	3.60	5.22	40.81	371
T_2	Hand weeding at 30 days after sowing	3.74	5.43	40.78	475
T_3	2, 4-D Na salt @ 625g a. i /ha at 35 days after sowing	3.80	5.48	40.94	472
T_4	Isoproturon @ 1 kg a. i /ha at 32 days after sowing	3.82	5.50	40.98	478
T_5	Sulfosulfuron @ 45g a. i /ha at 35 days after sowing	3.93	5.66	40.98	485
T_6	2, 4-D Na salt @ 625g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing	4.02	5.79	40.97	477
T_7	Isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing	4.22	6.10	40.89	480
T_8	Sulfosulfuron @ 45g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing	4.18	5.94	41.30	481
T_9	Isoproturon @ 1 kg a. i /ha tank mix with 2, 4-D @ 0.5kg a. i /ha at 32 days after sowing	3.93	5.62	41.15	490
T_{10}	Weed free	4.30	6.25	40.75	477
					478
					483
					484
					472
					487
					14.97
	C.D. (P=0.05)	0.20	0.31	NS	NS

NS= Non-significant

Table 4: Evaluation economics of wheat in integrated weed management practices (pooled data of 2 years)

Treatments		Yield of wheat						
		Cost of cultivation (Rs./ha)		Gross returns (Rs./ha)		Net returns (Rs./ha)		
		2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2010-11
T_1	Weed check	358	371	86.4	93.3	457.3	513.4	371
T_2	Hand weeding at 30 days after sowing	462	475	94.6	98.2	652.8	734.4	475
T_3	2, 4-D Na salt @ 625g a. i /ha at 35 days after sowing	461	472	92.9	97.5	538.9	605.2	472
T_4	Isoproturon @ 1 kg a. i /ha at 32 days after sowing	464	478	101.4	107.7	736.1	827.9	478
T_5	Sulfosulfuron @ 45g a. i /ha at 35 days after sowing	466	485	98.8	107.2	763.3	856.8	485
T_6	2, 4-D Na salt @ 625g a. i/ha at 35 days after sowing + hand weeding at 30 days after sowing	462	477	101.2	105.9	705.5	792.2	477
T_7	Isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing	466	480	100.8	106.7	727.6	817.1	480
T_8	Sulfosulfuron @ 45g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing	466	481	101.2	107.1	775.2	870.4	481
T_9	Isoproturon @ 1 kg a. i /ha tank mix with 2, 4-D @ 0.5kg a. i /ha at 32 days after sowing	486	490	101.7	108.4	817.7	919.7	490
T_{10}	Weed free	463	477	98.1	101.1	668.1	720.8	477
								478
								483
								484
								472
								487
	S.E.±	3.40	14.97	3.32	0.825	6.89	29.19	14.97
	C.D.(P=0.05)	6.96	NS	6.81	1.69	14.11	59.78	NS

NS= Non-significant

practices. Harvest index did not differ significantly among the different weed control treatment, where as sulfosulfuron @ 45g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing and hand weeding at 30 days after sowing followed by weed check recorded significantly lowest harvest index than sulfosulfuron @ 45g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing which was at par with isoproturon @ 1 kg a. i /ha tank mix with 2, 4-D @ 0.5kg a. i /ha at 32 days after sowing during both the years.

Effect on economics :

Table 4 revealed that; all weed control treatments recorded higher net returns than weedy check. Among the herbicidal treatments, maximum net returns (Rs. 817.7/ha and Rs. 919.7/ha during 2011-12 and 2012-13, respectively) was obtained under isoproturon @ 1 kg a. i /ha tank mix with 2, 4-D @ 0.5kg a. i /ha at 32 days after sowing over all the treatments including weed-free treatments, followed by sulfosulfuron @ 45g a. i /ha at 35 days after sowing + hand weeding at 30 days after sowing. The higher net returns under isoproturon @ 1 kg a. i /ha tank mix with 2, 4-D @ 0.5kg a. i /ha at 32 days after sowing was due to lower cost of herbicides.

Conclusion :

Thus, it can be concluded that integrated weed management can increase the growth parameters and grain yield of wheat and the yield can be improved by the adaptation of chemical as well as cultural weed control practices. Among the weed control measures isoproturon @ 1 kg a. i /ha at 32 days after sowing + hand weeding at 30 days after sowing gave highest grain yield (4.22 tonnes/ha) as well as straw yield (6.10 tonnes/ha) but on commercial scale ; isoproturon @ 1 kg a. i / ha tank mix with 2, 4-D @ 0.5kg a. i /ha at 32 days after sowing is recommended because the economic analysis (Table 4) reveals that this treatment gives significantly highest net returns Rs. 817.7 and Rs. 919.7 during 2011-12 and 2012-13, respectively.

REFERENCES

Alam, M.S., Islam, M.N., Zaman, A.K.M., Biswas, B.K. and Saha, M.K. (1996). Relative efficiency and economics of different cultural methods and herbicides for weed control in transplanted aus rice. *Bangladesh J. Agric. Sci.,* **23**: 67-73.

Bansal, G.L. (1993). Allellopathy and weed science. In: Proceedings of international symposium on integrated weed management for sustainable agriculture. *Indian Society Weed Sci.,* **1**: 283-7.

Bharat, R. and Kachroo, D. (2007). Bio-efficiency of various herbicides and their mixtures on weeds and yield of wheat (*Triticum aestivum* L.) under subtropical agro-ecosystem. *Indian J. Agron.,* **52** (1): 53-59.

Bindhani, A., Barik, K.C., Garnayak, L.M. and Mahapatra, P.K. (2007). Nitrogen management in baby corn (*Zea mays*). *Indian J. Agron.,* **52** (1): 49-52.

Gopinath, K.A. and Kundu, S. (2008). Effect of dose and time of atrazine application on weeds in maize (*Zea mays*) under mid-hill conditions of Northwestern Himalayas. *Indian J. Agric. Sci.,* **78** (3): 254-257.

Gupta, R.D., Kaistha, B.P. and Kher, D. (2007). Ecology of *Azotobacter* in soils of Himachal Pradesh and effect of its isolates on maize crop. *Environ. & Ecol.,* **25 S** (4A): 1304-1308.

Jain, N., Mishra, J.S., Kewat, M.L. and Jain, V. (2007). Effect of tillage and herbicides on grain yield and nutrient uptake by wheat (*Triticum aestivum* L.) and weeds. *Indian J. Agron.,* **52** (2): 131-134.

Kumar, B. and Walia, U.S. (2003). Effect of nitrogen and plant population levels on competition of maize (*Zea mays* L.) with weeds. *Indian J. Weed Sci.,* **35** (1 & 2): 53-56.

Meena, N.L. and Chaudhary, G.R. (2007). Effect of oxadiargyl *vis-à-vis* pendimethalin in controlling weeds in cumin (*Cuminum cyminum* L). In: Procedings of National Seminar on Production, Development, Quality and Export of Seed Spices – Issues and Strategies, held during 2 to 3 February 2007 at NRCSS, Ajmer (RAJASTHAN) INDIA.

Mishra, J.S. (2006). Efficiency of herbicides in wheat (*Triticum aestivum* L.) with special reference to wild oat in vertisols. *Indian J. Agron.,* **51** (4): 307-309.

Pandey, I.B., Dwivedi, D.K. and Pandey, R.K. (2007). Efficiency of herbicides and fertilizer management on weed dynamics in wheat (*Triticum aestivum* L.). *Indian J. Agron.,* **52** (1): 49-52.

Sharma, M.L. and Chauhan, Y.S. (1995). Cultural and chemical weed management control in Indian mustard (*Baassica juncea* L.). *Indian J. Agron.,* **40** (2): 235-238.

Sharma, R. (2005). Integrated weed management in *Kharif* maize. *Intensive Agriculture* May-June 6-7.

Singh, D. and Choudhary, J. (2008). Effect of plant population and fertilizer levels on yield and economics of pop corn (*Zea mays indurata*). *Indian J. Agric. Sci.,* **78** (4): 370-371.

Singh, M., Sharma, B.C., Sharma, N., Bali, A.S. and Khushu, M.K. (2007). Performance of maize cultivars as affected by

solar radiation under Jammu conditions. *Environ. & Ecol.*, **25 S** (4A): 1304-1308.

Sinha, S.P., Prasad, S.M. and Singh, S.J. (2005). Nutrient utilization by winter maize (*Zea mays*) and weeds as influenced by integrated weed management. *Indian J. Agron.*, **50** (4): 303-304.

Tripathi, A.K., Tewari, A.N. and Prasad, A. (2005). Integrated weed management in rainy season maize (*Zea mays*) in central Utter Pradesh. *Indian J. Weed Sci.*, **37** (3 & 4): 269-270.

Upadhyay, U.C. (1984). Weed management in oilseed crops. In: Proceeding of symposium-oilseed production and utilization constraints and oppottunities, pp. 491 – 499.