ISSN : 2348-8069 Int.J.Adv. Res.Biol.Sci.2014; 1(5):113-119

International Journal of Advanced Research in Biological Sciences

www.ijarbs.com

Research Article

Efficacy of different weedicides for the control of narrow leaf weeds of wheat in standing cotton under ecological conditions of Rahim yar khan

Laila Khalid[1] Ashiq Hussain Sangi[2] and M. Aslam[3]

[1] Assistant Research Officer (Plant Protection)
[2]Senior Subject Matter Specialist (Plant Protection)
[3] Senior Subject Matter Specialist (Agronomy)
Department of Adaptive Research Farm, Rahim Yar Khan Punjab- Pakistan

*Corresponding author e-mail: *Laila_kld@yahoo.com*

Abstract

A study was carried to see the efficacy of narrow leaf weeds of wheat in standing cotton under ecological conditions of Rahim yar khan at Adaptive Research Farm during 2009-10 to 2011-12. Cotton is the most important cash crop of Pakistan and its early picking for timely sowing of rabi crops seems impossible. Relay cropping technology for wheat could be a sound way to tackle this problem in the areas where planting of wheat is delayed due to late maturity and harvesting of cotton. The experiment was laid out in RCBD with three replications, with a plot size of 6 m × 10 m. The herbicides namely Penoxaden (Axial) 50 EC @825ml ha^{-1}, Clodinafop (Topik) 15WP @ 300g $ha^{-1.}$ Fenoxaprop-p-ethyl (Puma Super) 69 EW @1250ml ha^{-1} and Atlantis 3.6 % W.G @400g ha^{-1} + Bio power @ 400ml ha^{-1} were used to control narrow leaf weeds such as dumbi sitti *Phalaris minar* and jangli jai *Avena fatua* of wheat in standing cotton. A check plot was left unweeded. The weeds under study were naturally occurring and were not seeded. All weedicides decreased weeds population over weedy check. Axial and Atlantis + Bio power gave the best control of narrow leaf weeds 79 and 67% respectively without being phytotoxic to wheat crop in standing cotton.

Keywords: Relay cropping. Narrow leaf weeds. *Avena fatua* and *Phalaris minar*

Introduction

Wheat (*Triticum aestivum* L.) is one of the important cereal crops in the world and it has the widest distribution among cereal crops. The crop is primarily grown for its grain, which is consumed as human food. Wheat is a staple food of about one third of the world's population including Pakistan. In Pakistan wheat is the most important cereal crop both in terms of production and area under cultivation. Wheat was cultivated on an area of 9062 thousand hectares, showing an increase of 5.9 percent over last year's area of 8550 thousand hectares. The size of wheat crop is provisionally estimated at 23.4 million tons (Government of Pakistan, 2009).In Punjab (Pakistan), there are predominantly cotton -wheat - cotton and rice-wheat-rice cropping systems. The scarcity of the labor for cotton picking and late flowering span of the cotton varieties wastes a lot of time to harvest it. Because of this reason, it becomes harder to sow wheat at its proper time (Ihsanullah *et al*., 2002:

Hameed *et al*., 2003). *Phalaris minor* and *A.fatua* both belong to wheat family Gramineae competitive with wheat to reduce the yield severely. Noor *et.al*., 2007 reported that different formulations of Fenoxa group behaved differently to control the grassy weeds in wheat crop. The low productivity of *rabi* crops particularly that of cereals is ascribed to their very late sowing after harvest of cotton. Relay-intercropping is perhaps one of the most appealing forms of crop diversification because it entails the spatial and temporal plant-mixing attributes that can decrease plant competition for resources (Fukai and Trenbath 1993). Cotton is the most important cash crop of Pakistan and its early picking for timely sowing of *rabi* crops seems impossible (Govt. of Pakistan 2004). Despite the use of costly inputs and improved cultural practices Average yield of wheat is very low. The reasons for low yield are many but one of the most serious and less noticeable is the presence of weeds. In Pakistan it is estimated that annual losses caused by weeds may be 28 billion rupees (Marwat *et.al*., 2006). Relay cropping technology for wheat could be a sound way to tackle this problem in the areas where planting of wheat is delayed due to late maturity and harvesting of cotton. Timely sowing in the month of November yields promising results in terms of enhanced productivity of wheat. Environmental conditions at this time favour good seed germination and thus, lead to vigorous crop stand that reduces possibilities of insect pests attack and weed problems. Plants produce more number of tillers per unit area and leaf area is also increased which are instrumental in increasing yield due to efficient utilization of solar radiation in photosynthesis, a biological phenomenon by which plant conserves solar energy into carbohydrates which are utilized for growth and development. Wheat can be sown in standing cotton crop using broadcast method. Cotton is allowed to grow and harvested after taking last picking at the end of December or first week of January. This results in timely sowing of wheat and additional benefit from cotton yield is also possible. In relay cropping system a higher seed rate was used than recommended for the tilled seedbed. Thereafter, an adequate moisture supply was continued for facilitating seed germination and seedling establishment. (Zhang *et al*., 2007a). The yield advantage resulted from more light capture and a better acquisition of nutrients by wheat at the expense of the dry mass growth of cotton during the intercropping period. This confirms the findings reported for strip intercropped soybean, corn and wheat systems (Iragavarapu and Randall, 1996; Li et al., 2001). Relay-intercropping has been shown to reduce aphid densities and increase lady beetle densities compared with monoculture systems (Parajulee et al. 1997, Parajulee and Slosser 1999, Men et al. 2004, Ma et al. 2006). While studying the effect of varying degree of late sowing at an interval of 10 days on the yield of three wheat varieties,. Byerlee *et al.* (1984) observed that late planting reduced the tillering period and increased the risk of hot weather in critical period of grain filling which ultimately reduced the grain yield. Khan and Salim (1986) reported that early seeded crop resulted in higher yields as compared with late seeding.

Population of broad leaf weeds have been replaced by almost entirely by narrow leaf weeds in southern cotton zone of Bahawalpur. Among the narrow leaved weeds, *Phalaris minor* Retz and *Avena fatua* L. are predominant and wide spread, which are more aggressive and strong competitors for water, nutrients, light, space etc with the result that benefits of applied inputs are not fully realized. However successfull control of these weeds has been reported. Clodenofop, Isoprotoran and Fenoxaprop @247gm, 1.850 litha^{-1}and 1.235litha^{-1} respectively are effective to control *P.minor* and *A.fatua* in wheat (Mustaq *et.al.*, 2004). Another study reported that Topik @300gmha^{-1} and Puma Super @625mlha^{-1} gave maximum control of *P.minor* and *A.fatua* and maximum grain yield (Ghulam Abbas *et.al*., 2010).

Materials and Methods

A filed study was carried out at Adaptive Research Farm R.Y.Khan, Pakistan during Rabi season 2009-10 and 2011-12. Wheat variety Fsd-08 was sown in the 1st week of November in standing cotton with broadcast method. The cotton crop was sown in the month of April. Different weeicides and pesticides were used to control weeds and insects in that field. The experiment comprised of 5 treatments

replicated thrice using RCBD. The plot size was 6m × 10m. The herbicides namely Penoxaden (Axial) 50 EC @825ml ha^{-1}, Clodinafop (Topik) 15WP @ 300g ha^{-1}, Fenoxaprop-p-ethyl (Puma Super) 69 EW @1250ml ha^{-1} and Atlantis 3.6 % W.G @400g ha^{-1} + Bio power @ 400ml ha^{-1} were used to control narrow leaf weeds such as dumbi sitti *Phalaris minar* and jangli jai *Avena fatua* of wheat in standing cotton. A check plot was left unweeded. The weeds under study were naturally occurring and were not seeded. Nitrogen and Phosphorus were applied at 128-114-0 kg ha^{-1} respectively. Full dose of $P_2 o_5$ was applied at sowing and N was applied in two equal doses. The cotton sticks were removed from the field during mid January. The irrigation was applied at crown root initiation, tillering, booting and milking stages of wheat. All other cultural practices were kept normal and uniform for all the experimental units. The weeds were counted from two different places randomly selected (one square meter) in each experimental plot before spray and 4 weeks after herebicidal spray, weed mortality %age were estimated. Table -1 indicated those herbicides which were used in that experiment.

The crop was harvested in the 2nd week of April during these two years. No .of weeds before and after spray m^{-2}, germination m^{-2} number of fertile tillers m^{-2}, plant height, no.of grains $spike^{-1}$, 1000 grain weight and grain yield were recorded by following the standard procedures. The collected data were analyzed statistically using Fisher analysis of variance technique and treatments means were compared by least significant difference (LSD) test at 5% probability level (Steal *et.al*., 1997).

Results and Discussion

The common narrow leaved weeds found in the experimental area during the study years were *Phalaris minor* and *A.fatua.* Weed species at the site were assumed to be similar in control and tested plots however, *Phalaris minor* infestation was higher than *A.fatua* during the years of study.

Weeds mortality (%age)

The data (table-2) indicated that during two years study weeds mortality was significant as compared with control. In narrow leaved weeds the average highest mortality (79%) was observed in T_1 i.e. Penoxaden (Axial) 50 EC @825ml ha^{-1} followed (67%) by T_4 Atlantis 3.6 % W.G @400g ha^{-1} + Bio power @ 400ml ha^{-1}. Clodinafop (Topik) 15WP @ 300g ha^{-1} and Fenoxaprop-p-ethyl (Puma Super) 69 EW @1250ml ha^{-1} were given mortality as 53 and 58% respectively. These results are similar to those of Noor *et.al*., (2007).

Weeds mortality was calculated by the formula given as.

$$\text{Weeds mortality\%} = \frac{\text{Total no. of weeds before spray - Total no. of weeds after spray}}{\text{Total no. of weeds before spray}} \times 100$$

Germination m^{-2}

As indicated in the Table-2 maximum average germination 185.5m^{-2} were produced in Axial treated plot during both the years. Minimum average germination 127m^{-2} was recorded in weedy check Higher germination in herbicidal treated plots was due to herbicidal effect on crop. If the germination is good it produces better tiller formation in standing cotton crop. If the germination is poor it produces less tillers which automatically reduces yield of wheat crop. These results are also in accordance with Cheema and Akhtar, 2005.

Fertile tillers m^{-2}

As indicated in the Table-2 maximum average number of fertile tillers 402.5m^{-2} were produced in Axial treated plot. Minimum average number of fertile tillers 298.5m^{-2} was recorded in weedy check. Herbicidal treated units produced 16.54-30.8 % more fertile tillers than the weedy check, which contributed a lot to the final grain yield. Higher number of fertile tillers in herbicidal treated plots was due to herbicidal effect on crop and better utilization of nutrients. These results are also in accordance with Cheema and Akhtar, 2005 and Noor *et.al*., 2007.

Table-1 Detail of herbicidal treatments used for narrow leaved weeds of wheat in standing cotton

	Products name	Dose
T_1	Penoxaden (Axial) 50 EC	825 ml ha^{-1}
T_2	Clodinafop (Topik) 15WP	300g ha^{-1}
T_3	Fenoxaprop-p-ethyl (Puma Super) 69 EW	1250ml ha^{-1}
T_4	Atlantis 3.6 % W.G + Bio power	400g ha^{-1} + 400 ml ha^{-1}
T_5	Control	

Table-2 Effect of different herbicides mortality %age against Narrow leaf weeds during 2009-12

Treatments	No. of narrow leaf weeds before spray m^{-2}			No. of narrow leaf weeds after spray m^{-2}			%age Mortality		
	2009-10	2011-12	Av.	2009-10	2011-12	Av.	2009-10	2011-12	Av.
T_1	100	93	96	81	73	77	81	78	79
T_2	106	100	103	59	51	55	55	51	53
T_3	112	101	106	65	59	62	58	59	58
T_4	118	109	113	78	74	76	66	68	67
T_5	-	-	-	-	-	-	-	-	-

Table-2 Effect of different herbicides on germination m^{-2} and number of fertile tillers of wheat during 2009-12

Treatments	Germination m^{-2}			Number of fertile tillers m^{-2}		
	2009-10	2011-12	Av.	2009-10	2011-12	Av.
T_1 Axial	187a	184a	185.5a	407a	398a	402.5a
T_2 Topik	160bc	152c	156bc	303c	321d	312d
T_3 Puma super	143cd	155bc	149bc	364b	345c	354.5c
T_4 Atlants + bio power	170ab	165b	167.5b	369b	379b	374b
T_5 Control	128d	126d	127d	293d	304e	298.5e
LSD (0.05)	13.42	9.25		9.859	17.25	

Table- 3 Effect of different herbicides on plant height (cm) and number of grains spike^{-1} of wheat during 2009-12

Treatments	Plant height (cm)			Number of grains spike^{-1}		
	2009-10	2011-12	Av.	2009-10	2011-12	Av.
T_1 Axial	110a	108a	109a	35.45a	34.2a	34.82a
T_2 Topik	93d	97d	95d	29.76cd	30.46bcd	30.11bcd
T_3 Puma super	98c	101c	99.5c	31.20bc	31.66bc	31.43bc
T_4 Atlants + bio power	103b	105b	104b	32.75bc	32.3b	32.52b
T_5 Control	87.3e	92e	89.65e	27.23e	24.26e	25.74e
LSD (0.05)	4.25	2.75		1.98	1.75	

Table-4 Grain yield kg ha^{-1} and 1000 grain weight as affected by different herbicides during 2009-12

Treatments	Grain Yield kg ha^{-1}			1000 grain weight (g)		
	2009-10	2011-12	Av.	2009-10	2011-12	Av.
T_1 Axial	4333.3a	4493.3a	4413.3a	43a	42a	42.5a
T_2 Topik	3467.3d	3096.6d	3281.9d	31d	33.32c	32.16d
T_3 Puma super	3768.2c	3506.6c	3637.4c	35c	34.33c	34.66c
T_4 Atlants + bio power	4024.6b	3943.3b	3983.9b	39b	38.37b	38.68b
T_5 Control	3145.4e	2640e	2892.7e	26e	28.37d	27.18e
LSD (0.05)	196.25	315.23		31.25	2.767	

Plant height

As indicated in Table-3 maximum plant height 109cm was observed in Axial treated plot. Minimum plant height was recorded in weeds check i.e 89.65cm. Higher plant height was due to the herbicidal effect which ultimately increases the plant growth and yield. These results are in conformity with Khan *et. al*., 2004 and Ghulam Abbas *et.al*., 2010. They confirm the herbicidal effect increases the plant growth and height.

Number of grains spike^{-1}

As indicated in Table-3 maximum average number of grains spike^{-1} 34.82 was observed in Axial treated plot during both years. Minimum average number of grains spike^{-1} was recorded in weeds check i.e 25.74. Higher plant height was due to the herbicidal effect which ultimately increases the plant growth and yield. These results are in conformity with Khan *et. al*., 2004 and Ghulam Abbas *et.al*., 2010.

1000 grain weight (g)

It is evident from the yield components Table-4 that maximum average 1000 grain weight of 42.5g was recorded in Axial which was better than all the other herbicides. Minimum average 1000 grain weight 27.18g was recorded in weedy check. Most of the herbicidal treatments gave higher grain weight but 2.70 to 20.78 % more than weedy check.Generally increase in grain weight is due to utilization of nutrients, height and space which is benefit from weed free plot. The results are similar to Aslam *et.al*., 2007 and Ghulam Abbas *et.al*., 2010.

Grain yield kg ha^{-1}

It is evident from the data Table-4 that maximum average grain yield of 4413.3 kg ha^{-1} was produced in Axial which was followed by Atlantis + Biopower, Puma super and Topik which yielded 3983.9 kg ha^{-1}, 3637.4kg $^{-1}$ and 3281.9 kg ha^{-1} respectively. It was further recorded that herbicidal treated units produced 27-108 % more yield than the weedy check. Minimum average grain yield was recorded in weedy check 2892.7kg ha^{-1}. Best performance of Axial, Atlantis and Puma super could be attributed to the best control of weeds, minimum weed competition and better utilization of nutrients which ultimately increased grain yield. These results are also in collaboration with Aslam *et.al*., 2007 and Noor *et.al*.,2007. They also reported that herbicidal treated units significantly increased the grain yield in wheat crop.

Conclusions

It is concluded that different herbicide groups behaved differently to control narrow leaved weeds. Axail and Atlantis + Biopower gave best control of grassy weeds & maximum grain yield of wheat in standing cotton. Thus it is recommended to use Axail @ 825 ml ha^{-1} and Atlantis 400 g ha^{-1}respectively to get maximum grain yield of wheat in standing cotton under the arid climate of Pakistan

References

Aslam, M., M.Hussain., G.Hussain and A. Rashid. 2007. Efficacy of different herbicides for weed control in wheat crop in Pak.J. Weed Sci.Res.13 (1-2):1-7.

Byerlee. D., Sheikh, A.D., Aslam, M. and Hobbs, P.R. 1984. Wheat in rice based farming system of the Punjab. Implications for research and extension. AERU/NARC/CIMMYT. Wheat Paper, pp: 49.

Cheema, M. S and M. Akhtar. 2005. Efficacy of different post emergence herbicides and their application methods in controlling weeds in wheat. Pak. J. Weed Sci. Res. 11 (9-12): 23-29.

Fukai, S., Trenbath, B.R., 1993. Processes determining intercrop productivity and yields of component crops. Field Crops Research 34, 247–271.

Ghulam, A., M. A Ali, R. Hussain, Z. Abbas, M. Aslam, and M. Nawaz. 2010. Performance of different herbicides for the control of wild oats and yield of wheat crop under arid climate of Punjab, Pakistan. Pak. J. Weed Sci. Res. 16 (2): 139-144.

Government of Pakistan (2004) "Economic Survey of Pakistan", FinanceDivision, Economic Wing, Islamabad, Pakistan.

Hameed EW, Shah A, Shad AA, Bakhat J, Muhammad T (2003). Effect of different planting dates, seed rates and nitrogen levels on wheat. Asian J. Plant Sci., 2 (6): 467-474.

Ihsanullah A, Jan FH, Taj IA, Khan N (2002). Effect of sowing dates on yield ad yield components of Mash bean. Asian J. PIant Sci., 1(6): 622-624.

Iragavarapu T, Randall G. 1996. Border effects on yields in a strip-intercropped soybean, corn, and

wheat production system. J.Prod. Agric. 9:101-107.

Khan, A. and Salim, M. 1986. Grain yield as influenced by seeding dates in wheat NWFP. Pakistan J. Agric. Res., 7(1): 14-16.

Khan, I., G. Hassan and K.B. Marwat. 2004. Efficacy of different herbicides for controlling weeds in wheat crop-II. Weed dynamics and herbicides. Pak. J. Weed Sci. Res. 8 (1-2): 41-47.

Li L, Sun JH, Zhang FS, Li XL, Yang SC, Rengel Z. 2001. Wheat/maize or wheat/soybean strip intercropping I. Yield advantage and interspecific interactions on nutrients. Field Crops Res.. 71:123- 137.

Ma, X. M., X. X. Liu, Q. W. Zhang, J. Z. Zhao, Q. N. Cai, Y. A. Ma, and D. M. Chen. 2006. Assessment of cotton aphids, *Aphis gossypii*, and their natural enemies on aphid-resistant and aphid-susceptible wheat varieties in a wheatÐ cotton relay intercropping system. Entomol. Exp. Appl. 121: 235Ð241

Marwat, K. B., Z. Hussain, B. Gul, M. Saeed and S. Din. 2006. Survey on weed problems in wheat crop in district Mardan. Pak J. Weed Sci. Res. 12(4): 353-358.

Men, X. Y., F. Ge, E. N. Yardim, and M. N. Parajulee. 2004. Evaluation of winter wheat as a potential relay crop for enhancing biological control of cotton aphids in seedling cotton. BioControl 49: 710Ð714.

Mustaq, A., S. Shahzad, M. Qamar, M.A. Ali.2004. Efficacy and Economics of different herbicides against narrow leaved weeds in wheat Int. J. Agri. Biol., Vol. 6 (4): 647-651.

Noor, M., A. Sattar, M. Ashiq, I. Ahmad and N. Ahmad. 2007. Comparative efficacy of different fenoxaprop formulations to control monocot weeds in wheat. J. Agric. Res. 45(4): 283-288.

Parajulee, M. N., R. Montandon, and J. E. Slosser. 1997. Relay intercropping to enhance abundance of insect predators of cotton aphid (*Aphis gossypii* Glover) in Texas cotton. Int. J. Pest Manage. 43: 227Ð232.

Parajulee, M. N., and J. E. Slosser. 1999. Evaluation of potential relay strip crops for predator enhancement in Texas cotton. Int. J. Pest Manage. 45: 276d 286.

Steel, R.G.D., J.H. Torrie and D.A. Dickey. 1997. Principles and Procedures of statistics. A biometrical approach, 3rd edition. Mc Graw Hill Book Inc. Co. New.

Zhang L. 2007. Productivity and resource use in cotton and wheat relay intercropping. PhD thesis, Wageningen University, Wageningen, The Netherlands. 188 pp. ISBN:978 90-8504-759-9.