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Integrated Weed Management Strategies in Wheat Crop

Muhammad Imran Zakariyya1*, Inayat Ullah Awan [1], Ejaz Ahmad Khan [1], Mohammad Safdar Baloch [1], Abdul Aziz Khakwani[1]

[1]Department of Agronomy, Gomal University, Dera Ismail Khan, Pakistan *

Corresponded to: Muhammad Imran Zakariyya, Department of Agronomy, Gomal University, Dera Ismail Khan, Pakistan, Tel: 923484468650; E-mail: zakriyya.uaf@gmail.com

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Abstract

An experiment to study the impact of integrated weed management strategies in wheat was carried out at agronomic research area, faculty of agriculture, Gomal University, Dera Ismail Khan, during the year 2010-2011. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications and ten treatments. The net plot size was kept as 5 m × 2 m (10 m2). The treatments included single, double and triple hoeing with kasola. Three hoeing with khurpa, puma super applied at first and second irrigation. Sonic, Buctril super, weed control throughout the season and no weeding (check). The results revealed that the application of herbicides and hoeing significantly affected the weed biomass (g m-2), number of tillers (m-2), spike length (cm), 1000-grain weight (g), grain yield (t ha-1), and biological yield (t ha-1). Weed free crop throughout the season it remains on top more than grain and biological yield gave the highest grain yield (6.167 t ha-1) and biological yield (11.42 t ha-1). Among various herbicides, Buctril super recorded maximum grain yield (4.767 t ha-1) and biological yield (9.953 t ha-1). The lowest Cost-Benefit Ratio (0.33) was recorded in Buctril super treatment.

Keywords: Herbicides; Biological yield; Buctril super treatment

Introduction

Wheat (Triticum aestivum L.) is the basic component of human diet. It is the most widely grown cereal grain crop in the world, except in the rice-eating regions of Asia. Wheat products are the principal cereal foods of an overwhelming majority of the world inhabitants. It has great adaptability to a wide variety of soil and climatic conditions. It is staple food of the people of Pakistan and serves as backbone in the economy of the country. Among all cereals, wheat is the most preferred food for human being. It is planted to a limited extent as a forage crop for livestock and the straw can be used as fodder for livestock. Globally, it is the most important food grain and ranks second in total production as a cereal crop behind maize, the third being rice [1]. It is reported that 100 g of wheat grain contains 326-335 calories, 11.57-14.0 g water, 9.4-14.0 g protein, 1.2-2.5 g fat, 69.1-75.4 g total carbohydrate, 1.8-2.3 fibre, 1.7 g ash, 36-46

mg calcium, 354-400 mg phosphorus, 3.0-4.3 mg iron, 370-435 mg potassium, 0.43-0.66 mg thiamine, 0.11-0.12 mg riboflavin and 4.3-5.3 mg niacin. Yields of wheat continued to increase, as new land came under cultivation and with improved agricultural husbandry involving the use of fertilizers, threshing machines and reapers and tractor-drawn cultivators. The yield per unit area obtained in our country is far less than the yield of developed countries of the world. Besides various causes of low grain yield per unit area, presence of weeds is a key factor of reduction in yields. Weeds compete with crop for light, nutrient, water and carbon dioxide.. Moreover, they observed that weeds consume three to four times more nitrogen, potassium and magnesium than weed free crop. Weeds exert stress on the cultivated crop through interference, consisting of competition, allopathy and parasitism and by providing habitat for other harmful organisms. Weeds not only reduce the yield of crops but also deteriorate the quality of farm produce by contaminating the seed, thereby reducing its market value. The annual losses to wheat crop due to weed infestation in Pakistan and K.P.K. province in monetary terms amount to Rs. 28 billion and Rs. 2 billion, respectively. These enormous figures warrant an efficient control of weeds for lucrative economic returns. The eradication of weeds from the cropped field is, therefore, very essential for obtaining good crop stand and high economic returns. From the start of settled agriculture up to the middle of the 20th century, the plough and hoe have been the main direct methods of weed control although fire, howling, mowing and smothering have also been applied. Conventional methods of weed control are weather dependent, tedious, laborious, time consuming and costly. Crop mimicry by grassy weeds like wild oats and canary grass complicates the success of manual weed control strategies. Now weed technology has entered a scientific phase and chemical weed control is being more emphasized in modern agriculture. Chemical weed control is less dependent on weather and hence more practicable for use during the critical period of weed crop competition. The use of chemicals is usually easy, time saving, highly effective and most economical approach to weed control. However, it may not be environmentally safe as manual, mechanical and biological methods of weed control [2]. Integrated Weed Management (IWM) is the careful consideration of all available weed control techniques and subsequent integration of appropriate measures that discourage the development of weed and keep herbicides and other intervention to levels that are economically justified and reduce or minimize risks to human health and the environment. Integrated weed management emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms. Integrated weed management takes into account all relevant control tactics and methods available locally, evaluating their potential cost effectiveness. It does not, however, consist of any absolute or rigid criteria. Implementation of IWM lies with farmers, who adopt those elements of IWM, which are seen to be practical and benefit to their activities. Materials and Methods an experiment, titled, “Integrated weed management strategies in wheat” was carried out at Agronomic Research Area, Faculty of Agriculture, Gomal University Dera Ismail Khan, and Pakistan during winter season 2010-2011. The experiment was laid out in a randomized complete block design with ten treatments and three replications. The net plot size was kept 5 m × 2 m (10 m2). Wheat variety Hashim-8 was sown on a well-prepared seedbed with single row hand drill. Seed rate was used as 100 kg ha-1. Urea, Di-Ammonium Phosphate (DAP) and

Sulphate of Potash (SOP) 150 kg N, 120 kg P2O5 and 60 kg K2O ha-1 was applied respectively. Full dose of phosphorus, potash and half dose of nitrogen were applied at seedbed preparation while the rest of nitrogen was applied at the time of first irrigation. All other cultural practices were kept uniform for all treatments. Fresh weed biomass (g m-2), Dry weed biomass (g m-2), Days to 50% heading, plant height (cm) , Number of tillers (m-2), Spike length (cm), Number of grains (spike-1), 1000- grain weight (g), grain yield (t ha-1), Biological yield (t ha-1), harvest index (%) and Cost Benefit Ratio (CBR) the data collected were subjected to analysis of variance techniques and differences among between individual means of each parameter were performed by using MSTATC package [3]. Results and Discussion Weed infestation in wheat has become a serious problem resulting considerable reduction in wheat yield. Herbicides and manual weeding are commonly used to reduce weed infestation. The results pertaining to yield components and yield as influenced by the application of various herbicides and manual weeding are presented and discussed in this chapter. Fresh weed biomass (g m-2) after 60 days of sowing The broadleaved weeds predominantly germinated in the field were convolvulus arvensis (filed bind weed), Chenopodium album (Lamb's quarters), Medicoago denticulata (Bur Colver), Melitotus indica (White melilot), Rumex dentatus (Prickly dock) and Angalis arvensis (pimpernel). Among narrow leaved weeds, Avena fatua (Wild oat) and phalaris minor (Canary grass) were dominant in the experimental area. The data taken 60 days after sowing regarding Fresh Weed Biomass (FWB) is illustrated in Table 1 and its ANOVA is given in appendix I. The data shows that (FWB) was significantly affected by different weed management practices. From the table, it is indicated that the maximum Fresh Weed Biomass (FWB) of (109 g m-2) was recorded in T5 (Control) while the rest of other treatments T1 (One hoeing with kasola), T2 (Two hoeing with kasola), T7 (sonic), T9 (3-Hoeing with kasola) and T6 (3-hoeing with khurpa) have visible differences but statistically these treatments were at par with T5. The lowest (FWB) (97.88 g m-2) was observed in T4 (Weed free) but was at par with the remaining two treatments T10 and T3 [4]. The highest (FWB) in T5 (control) was due to the presence of abundant weeds in this treatment as no weed control measure was adopted while the lowest (FWB) was recorded in T4 (weed free) where weeding was done from time to time to eradicate weeds. Herbicides proved effective in decreasing weed (FWB). However, the efficiency of herbicides was different in controlling weeds. The application of Puma Super and Buctril Super effectively controlled weeds population resulting in lower FWB.

Results and Discussion

Weed infestation in wheat has become a serious problem resulting considerable reduction in wheat yield. Herbicides and manual weeding

Weed management strategies	FWB (g m-2) 60 days	DWB (g m-2) 60 days	Days to (gm-2) 50% heading	Plant height (cm)	Number of tillers (m-2)
One hoeing with Kasola	108.8	17.83	17.83	108	380

Two hoeing with Kasola	108.6	17.72	17.72	109.1	396
Puma Super (after 1st irrigation)	100.6	16.39	16.39	110.5	410

Table: Fresh weed biomass (gm-2) after 60 days of sowing, dry weed biomass (gm2) after 60 days of sowing, days to 50% heading, fresh weight biomass (gm-2) after 120 days of sowing, Dry weight biomass (gm-2) 120 days after sowing, plant height (cm), number of tillers (m-2) as affected by different weed management strategies

Conclusion

The use of different weed management strategies decreased weed density per unit area and increased wheat yield. Weed free treatment gave maximum grain and biological yield (t ha-1) of wheat than other treatments. Among different herbicides, Buctril super gave the highest grain yield (t ha-1). Though, both chemical and manual weed control methods gave excellent control of weeds but chemical control was found to be the most easiest, time saving and highly effective. The lowest CBR was recorded with application of Buctril super. Although the weeds free treatment, T5 produced the best results regarding grain yield but due to high cost of labour. Its seems difficult to be adopted by the farmers on large scale. Hence, on small scale it is the best option.