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Evaluation of Integrated Weed Management Technologies for the Control Annual Grasses and Broad Leaf Weeds in Wheat Fields of the Hadiya Zones of Southern Ethiopia

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Abstract

Weeds are a major pest of wheat production Ethiopia. It accounts yield loss above 36.3% in wheat due to uncontrolled weed growth. Field experiment was conducted to evaluate the efficacy of herbicides and cultural practices viz, palas, topic, hand weeding and weedy cheek were tested at Haqumura site in a Randomized Complete Block Design (RCBD) with four replications during 2018 and 2019. Except plant height all parameters like spike length, number of tiller per plant, biomass yield, number of seed per spike, 1000 seed weight, and seed weight per plot were significantly affected by the treatments. Especially those yield and yield components that are treated with agro chemical called Pallas 45 OD showed significant difference in all cases except plant height that is not significantly difference in all treatments. So in nutshell application of Pallas 45 OD according to company recommendation 30-35 days after weed emergence is the best agro chemical for the control of weed in wheat fields for our regions and other similar agro ecology especially for the control of wild oat in wheat fields next to hand weeding.

Keywords: Weed; Wheat; Herbicide; Evaluation; Hadiya

Introduction

Ethiopia is the largest producer of wheat in the sub-Saharan Africa. The current total area suited to wheat production in the country is estimated to be over 1.6 million ha, with an average grain yield of 1.8 tons per hectare [1]. Durum and bread are the two major wheat types produced in the country whose proportion in 1991 was about 60 and 40%, respectively [2]. Durum and bread wheat are indigenous to Ethiopia and have been cultivated since prehistoric period in the highlands.

Weed interference is one of the most important but less noticed factors, contributing towards lowering the yields of wheat [3]. Weeds not only reduce the crop yield, deteriorate the quality of farm produce but also trim down the market value of wheat. Weed management increases the cost of production and thus it is necessary to device such methods which could reduce the cost of production as well as save time and labor.

In crop-weed competition, a considerable yield loss will be encountered unless a management intervention is undertaken. An estimated yield loss of about 10% in the less developed countries and 25% in the least developed countries is caused by weeds [4]. In Ethiopia, a yield of loss of above 36.3% was recorded in wheat due touncontrolled

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weed growth [5]. Similarly, in a competition study of *Avenaabyssinica, Loliumtemulentum L., Snowdeniapolystachya* and *Phalarisparadoxa L.* with bread wheat, a yield loss of 48-86% were recorded by the maximum weed density of 320 weed seedlings/m2 [6]. In Durum wheat, Convolvulus *arvensis* and *Cyperussppposes* significant yield loss. Besides, considerable yield loss has been recorded in irrigated wheat due to *Sorghum arundnaceae. Cyperusesculentus, Cyprus rotundus Portulacaoleraceae, Corchorusolitoriusand Sorghum a undinaceaearound* 60% in were research.

International survey of herbicide resistant weeds affirmed that 315 resistant biotypes, 183 species (110 dicots and 73 monocots) found resisting herbicide over 290,000 fields. In Ethiopia, several broadleaf weed species exhibit a relatively high level of tolerance to phenoxy herbicides such as *Gallium spurium*, *Amaranthusretroflexus* and *Guizotiascabra*. This is due to continuous cereal monoculture that favors selection pressures of grass weeds herbicides with the same mode of action in these areas. This necessitates the need of studying the diversity of unknown weed species in the country at their existing agro-ecology and farming system. Although these challenges are exited, efforts have been done in the past to alleviate the problems.

Cultural, chemical and biological weed control activities can exert a strong selective influence on the weed populations. Thus, knowledge of the weed community structure is an important component of weed management, and is essential in setting priorities for both weed management and research.

Therefore, this study is initiated to develop chemical evaluation of different types of herbicides for the control of weeds in wheat field in relation with cultural practices to boost up wheat production and productivity and to improve the livelihood of wheat dependent communities. Thus the study was mainly focuses on the herbicides evaluation for the control weeds in wheat fields.

Materials and Methods

This experiment was carried out in major wheat growing areas of Hadiya zone one of substation of Areka agricultural research center called Haqumura station for two successive years 2018 and 2019 under field condition. For this study three herbicides with recommended agronomic practices were used for evaluation against weeds of wheat fields. Treatments are palas (30-35 DAE), topic (30-35 DAE, palas+topic (30-35 DAE), hand weeding (30-35 DAE) and (55-60 DAE) and weedy cheek. Design RCBD with four replication plot size 5.5 M. All data on yield and yield components of wheat was taken and subjected to SAS software for analysis.

Result and Discussion

Based on the research done four treatments: palas, topic, palas+topic, hand weeding and weedy cheek was applied on wheat weed trials among them best ones have been selected for the manangement of wheat weed at wheat growing areas of our region. Thus, statistical analysis using SAS system was run to select best agro chemicals for the control of weed of wheat fields with reference to weedy cheek. From the experiment yield and yield components of wheat statitically same and significantly different was selected and recomended for the wheat growing farmers of the region (Table 1).

	Parameters						
CV (%)	11	10	31.7	14.87	13.4	11	21
Grand mean	93.6733	7.2	2.8	17.38	39.41	51	4.28
Hand Weeding	93.867a	7.6167ab	3.6667a	17.983ab	37.203ab	55.167ab	4.8333a
Pallas	94.33a	7.85a	3.6667a	19.85a	42.617a	57a	4.95a
Pallas+Topic	93.76a	6.7833c	2.1667b	16.95ab	42.333a	46.333c	4.333ab
Topic	90.3a	6.8667bc	2.1667b	15.083b	40.233ab	49.167bc	3.55b
Treatments	Plant height mean Duncan Grouping	Spike Length mean Duncan Grouping	Number of tiller/plant mean Duncan Grouping	Biomass yield mean Duncan grouping	1000 seed weight mean Duncan grouping	Number of seed per spike mean Duncan grouping	Seed weight per plot mean Duncan grouping
Weedy cheek	94.33a	6.8667bc	2.3333b	17.033ab	34.68b	48c	3.75b

Table 1: The response of herbicides on mean plant height, spike length, number of tiller per plant, biomass yield, 1000 seed weight, number of seed per spike and seed weight per plot at Haqumura 2013 and 2014.

Conclusion

Based on above tables the influence of these chemicals (treatments) on the yield and yield components of wheat was not significantly different in the case of plant height but there is significant difference among spike length, number of tiller per plant, biomass yield, 1000 seeds weight, number of seed per spike and seed weight per plot. Especially those yield and yield components that are treated with agro chemical called Pallas 45 OD showed significant difference in all cases except plant height that is not significantly difference in all treatments.

Recommendation

Agro chemical called Pallas 45 OD showed significant difference when compared with other treatments so pallas 45 OD is the best agro chemical for the control of weed in wheat fields of our regions especially for the control of wild oat in wheat fields next to hand weeding.

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