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Bio-Efficacy of Brand Formulations of Pendimethalin - Penda 30 EC and Markpendi 30 EC for Control of *Phalaris minor* in Wheat

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ABSTRACT

The field experiment was conducted at Students' Research Farm, Department of Agronomy, Punjab Agricultural University, Ludhiana during *rabi* 2013-14 to study the bio-efficacy of two new brand formulations-Penda 30 EC and Markpendi 30 EC for control of *Phalaris minor* in wheat. New brand formulations of pendimethalin (Penda 30 EC and Markpendi 30 EC) @ 2.5 l/ha were tested against recommended brand formulation (Stomp 30 EC) @ 2.5 l/ha and unsprayed check in randomized block design in three replications. The tested new brand formulations of pendimethalin (Markpendi 30 EC and Penda 30 EC) were at par to earlier recommended brand (Stomp 30 EC) with respect to weed population, dry matter accumulation and wheat grain yield.

Key Words: Wheat, *Phalaris minor*, Pendimethalin, Weed control.

INTRODUCTION

Wheat is one of the premiere cereal crops of Punjab and is badly infested with both grasses and broadleaf weeds. *Phalaris minor* Retz (little seed canary grass) is a major weed of wheat crop in northern parts of India. The crop suffers a yield loss of 25-30 per cent due to infestation of this weed (Yadav and Malik, 2005) and is very difficult to distinguish it from wheat plant in its early growth stages. The weed evolved insensitivity to isoproturon–a urea herbicide after its continuous use for over 15 yrs. Alternative herbicides belonging to group I [(acetyl co-A carboxylase (ACCase) inhibitors] and group II [acetolactate synthase (ALS) inhibitors] were recommended for its management during 1997-98 (Yadav *et al* 1997; Brar *et al* 1999). ACCase and ALS inhibiting herbicides introduced for the control of isoproturon resistant *Phalaris minor* are now rapidly losing their effectiveness at many farms. The multiple herbicide-resistant populations had a low level of sulfosulfuron resistance but a high level of resistance to clodinafop and fenoxaprop (Chhokar and Shar, 2008). Some farmers have started using higher than the recommend doses or tank-mix of these herbicides to achieve control of *P. minor* in wheat. Evaluation of new herbicides with different modes of action offers an opportunity to manage herbicide resistant weeds. With limited herbicides options available pendimethalin appears to be the best option for management of *P. minor* (Dhawan *et al* 2012).

Pendimethalin [N-(1-ethylpropyl)-2, 6-dinitro-3,4-xylidine] is a herbicide of the dinitro-aniline group used as pre-emergence application to control annual grasses and certain small seeded broadleaf weeds. It inhibits cell division and cell elongation. Dinitroaniline herbicides kill susceptible plants by inhibiting cell division in root cells which arrests normal root growth. Pendimethalin is listed in the K1-group according to the HRAC classification and is approved in Europe, North America, South America, Africa, Asia and Oceania for different crops including cereals (wheat, barley, rice, maize, etc.), soybean, potato, legumes, fruits, vegetables, nuts as well as lawns and ornamental plants. Pre-emergence herbicide, pendimethalin has been recommended

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at 2.5 l/ha for spray immediately after sowing of the crop. For obtaining desirable effects, field should have good moisture content and dissolve pendimethalin in 500 – 750 l of water/ha for spraying on fully prepared seed bed. High spray volume adds to the efficacy of these herbicides. The present study was undertaken to evaluate new brand formulations of pendimethalin: Markpendi 30 EC and Penda 30 EC for controlling *Phalaris minor* in wheat.

MATERIALS AND METHODS

A field experiment was conducted to study the bio-efficacy of new brand formulations of pendimethalin Penda 30 EC and Markpendi 30 EC for control of *Phalaris minor* in wheat at Research farm of Depatment of Agronomy during *rabi* 2013-14. The soil of the experimental site was loamy sand with normal soil reaction and electrical conductivity, low in organic carbon and available nitrogen and medium in available phosphorus and potassium. The field was ploughed with disc harrow and a fine seed-bed was prepared with two ploughing with tractor drawn cultivator and two plankings after *rauni* irrigation. The drill sowing of wheat cv. HD 2967 was done at 22.5 cm row spacing after seed treatment at the seed rate of 100 kg/ha on 20.11.2013. Two new brand formulations of pendimethalin (Penda 30 EC of Shivalik Agrochemicals, Chandigarh and Markpendi 30 EC of Markfed) @ 2.5 l/ha were tested against recommended brand formulation (Stomp 30 EC) @ 2.5 l/ha and unsprayed check in randomized block design in 3 replications. The pre-emergence herbicide was sprayed using knap sack sprayer by dissolving in 500 l/ha of water with flat fan nozzle after sowing. The crop was raised with recommended package of practices, except weed control treatments. Weed dry matter of *Phalaris minor* was recorded at 60 days after sowing (DAS). The data on plant height, effective tillers, total weed dry matter, panicle length, grain yield and biological yield was recorded at the time of crop harvest on 04.04.2014. Weed control efficiency was calculated. The data collected on various parameters under study were statistically analyzed as prescribed by Cochran and Cox (1967). The comparisons were made at 5 per cent level of significance.

RESULTS AND DISCUSSION

Effect on *Phalaris minor*

The field was infested with *Phalaris minor*-a major grass weed of rice-wheat cropping system. The field was chosen especially with population of *Phalaris minor* which have shown resistance to clodinafop group of herbicides (Topik/Point/Moolah/Rakshak Plus/Jay Vijay/Topple). At 60 DAS, population of *Phalaris minor* was significantly controlled with all the formulations of pendimethalin i.e. Stomp, Markpendi and Penda as compared to unsprayed check. The results indicated that both new formulations of pendimethalin (Markpendi and Penda) gave effective control of *Phalaris minor* (Table 1) along with earlier recommended brand formulation Stomp. At harvest, weed dry matter accumulation was significantly affected by herbicide application. All the formulations, Stomp, Penda and Markpendi recorded statistically at par weed dry matter (217, 243, 246 g/m^2, respectively) and was significantly lower than unsprayed check (582 g/m^2). Weed control efficiency was 58 to 63 per cent at harvest. This indicates that pendimethalin has controlled resistant population of *Phalaris minor* very effectively. Further, farmers can opt

Table 1. Bio-efficacy of Penda 30 EC and Markpendi 30 EC for control of *Phalaris minor* and total weeds in wheat.

Treatments	*Phalaris minor* count (No./m^2)at 60 DAS	Total weed dry matter (g/m^2) at harvest	Weed control efficiency at harvest (%)
Unsprayed check	3.6 (12)	24.0 (582)	-
Stomp 30 EC (pendimethalin) @ 2.5 l/ha	2.6 (6)	14.8 (217)	62.7
Penda 30 EC (pendimethalin) @ 2.5 l/ha	2.6(6)	15.5 (243)	58.4
Markpendi 30 EC(pendimethalin) @ 2.5 l/ha	2.7 (6)	15.6 (246)	57.7
C.D. (p=0.05)	0.5	5.1	-

Figure within parenthesis are original means. Weed data is subjected to square root transformation.

Table 2. Effect of Penda 30 EC and Markpendi 30 EC on wheat growth, yield attributes and yield.

Treatments	Plant height at harvest(cm)	Effective tillers/m^2	Panicle length (cm)	Grain yield (q/ha)	Biological yield (q/ha)
Unsprayed check	67.0	240.0	11.4	42.4	110.8
Stomp 30 EC (pendimethalin) @ 2.5 l/ha	80.5	364.2	12.5	54.1	127.3
Penda 30 EC (pendimethalin) @ 2.5 l/ha	82.7	361.7	12.9	52.1	122.9
Markpendi 30 EC(pendimethalin) @ 2.5 l/ha	83.0	367.5	13.1	52.7	127.7
C.D. (p=0.05)	6.5	40.7	NS	7.7	11.9

for one hand pulling/post emergence spray of herbicide to control late flushes of *Phalaris minor* because it has been cited by researchers (Dhawan *et al* 2012) that pendimethalin residual activity remains for 1.0 to 1.5 months after spray.

Effect on Wheat crop

Weed control treatments have direct effect on growth, yield attributes and grain yield of any crop. Penda and Markpendi 30 EC, new brand formulations of pendimethalin recorded significantly taller plants (82.7 and 83 cm), more effective tillers (361.7 and 367.5 per m^2,) and biological yield (122.9 and 127.7 q/ha) which led to higher grain yield (52.1 and 52.7 q/ha) as compared to unweeded control (42.4 q/ha).

Due to better weed control in pendimethalin treated plots, the crop grows luxuriantly. So weeds do not compete with crop for light, moisture, space etc. and ultimately this was reflected in crop growth, yield attributes and grain yield. The panicle length of wheat spike did not vary with respect to different weed control treatments. The new brands- Penda and Markpendi 30 EC recorded grain yield statistically at par with earlier recommended herbicide Stomp (54.1 q/ha) but recorded significantly higher wheat grain yield than unsprayed check (Table 2). These results were in agreement with those reported by Pisal *et al* (2013).

CONCLUSION

The study revealed that new brand formulations of pendimethalin (Markpendi and Penda 30 EC) were at par to earlier recommended brand (Stomp) with respect to weed control and wheat grain yield. Pre emergence application of Markpendi 30 EC and Penda 30 EC (pendimethalin) at 2.5 l/ha within two days of sowing provided effective control of *Phalaris minor* in wheat. Another brand of pendimethalin will create healthy competition in the market and will help in breaking the monopoly of the company. Pendimethalin– a pre emergence herbicide can be used to effectively control resistant population of *Phalaris minor.* Further rotational use of different herbicide groups (Substituted ureas/ Clodinafop/ Sulfonylureas/ Dinitroanilines) or ready mix herbicide combination (Fenoxaprop+Metribuzin) can further delay the occurrence of resistance in *Phalaris minor*. Utmost care should be taken before selecting a particular herbicide for weed control depending upon cultivar being grown, cropping system to be followed, soil type and type of weed flora present.

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