

## EFFICACY OF DIFFERENT HERBICIDES AGAINST WEEDS IN DUAL PURPOSE WHEAT AND RESIDUAL EFFECT OF PENDIMETHALIN IN WHEAT FODDER

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### SUMMARY

A Field experiment was carried out at Research area of Department of Agronomy, CCS HAU Hisar (Haryana) during the *Rabi* seasons of 2015-16 and 2016-17. In present experiment nine treatment combinations were used viz. pendimethalin 1500 g/ha PRE alone ( $T_1$ ) and followed by (*fb*) post emergence (POE) application of pinoxaden 50 g/ha + metsulfuron 4 g/ha ( $T_2$ ), sulfosulfuron + metsulfuron (30+2) g/ha ( $T_3$ ) and clodinafop + metsulfuron (60+4) g/ha ( $T_4$ ) at 2 week after cutting (WAC), alone application of pinoxaden 50 g/ha + metsulfuron 4 g/ha ( $T_5$ ), sulfosulfuron + metsulfuron (30+2) g/ha ( $T_6$ ) and clodinafop + metsulfuron (60+4) g/ha ( $T_7$ ) at 2 WAC, weed free ( $T_8$ ) and weedy check ( $T_9$ ). After cutting of wheat for fodder, total weed density and dry weight at harvest stage were significantly reduced under sequential application of pendimethalin 1500 g/ha PRE *fb* pinoxaden + metsulfuron (50+4) 2 WAC (week after cutting at 55 DAS), pendimethalin 1500 g/ha PRE *fb* sulfosulfuron+ metsulfuron (30+2) 2 WAC and pendimethalin 1500 g/ha PRE *fb* clodinafop + metsulfuron (60+4) 2 WAC, but weeds under alone application of post emergence pinoxaden + metsulfuron (50+4) 2 WAC, sulfosulfuron+ metsulfuron (30+2) 2 WAC, clodinafop + metsulfuron (60+4) 2 WAC. Among herbicidal treatments, significantly higher weed control efficiency, grain yield and B: C ratio was observed under sequential application of herbicides which were significantly higher than weedy check and alone pre and post emergence application of herbicides during both the years of study.

**Key words :** Dual purpose wheat, cutting, fodder, herbicide mixture, sequential application

Dual purpose wheat means getting fodder as well as grain from the same crop. Wheat is used as a major source of food, but can be grown as dual purpose crop that provides greater benefit from both grain and fodder grown on the same piece of land (Shuja *et al.*, 2010). Wheat field is generally infested with both grassy and broad leaf weeds. Pendimethalin has long been used as a selective herbicide. Its persistence is influenced by cultivation practices, soil temperature and moisture conditions, as well as soil type. Arora and Tomar, (2008) reported that pendimethalin (1.0 kg/ha) applied to different *rabi* crops persisted in soil up to 75 days after application and beyond that no residues were left in soil. In recent years, the compound is subjected to increase toxicological and environment concerns, e.g., to cause various physiological changes and endocrine effects in the animal studies including liver, kidney damage and number of mutagenic effects (Dimitro *et al.*, 2006). A number of herbicides have been recommended for grain crop of wheat for the

management of both grassy and broad leaf weeds. The evaluation of these herbicides also required in dual purpose wheat by applying them after cutting the crop for fodder. Herbicide residue estimation in wheat fodder is very essential to analyze the quality of the fodder.

### MATERIALS AND METHODS

Field experiment was conducted at research area of Department of Agronomy, CCS HAU Hisar during the *Rabi* season of 2015-16 and 2016-17. Wheat (*T. aestivum*) variety C-306 was raised with recommended package and practices. The soil of experimental field was sandy loam in texture with 60.25% sand, 28.75% silt and 11% clay, slightly alkaline in reaction with pH 8.1. The experiment was laid out in a Randomized Block Design, having nine treatment combinations with three replications. Treatments consisted of pendimethalin 1500 g/ha PRE

alone ( $T_1$ ) and followed by (*fb*) post emergence (POE) application of pinoxaden 50 g/ha + metsulfuron 4 g/ha ( $T_2$ ), sulfosulfuron + metsulfuron (30+2) g/ha ( $T_3$ ) and clodinafop + metsulfuron (60+4) g/ha ( $T_4$ ) at 2 week after cutting (WAC), alone application of pinoxaden 50 g/ha + metsulfuron 4 g/ha ( $T_5$ ), sulfosulfuron + metsulfuron (30+2) g/ha ( $T_6$ ) and clodinafop + metsulfuron (60+4) g/ha ( $T_7$ ) at 2 WAC, weed free ( $T_8$ ) and weedy check ( $T_9$ ). Residual analysis of the pendimethalin in wheat fodder was carried out using Tandem mass spectrometry.

**RESULTS AND DISCUSSION**

**Total weed dry weight and weed density :**

Dry matter accumulation by weeds increased progressively with the advancement of crop age. The maximum dry matter was recorded at harvest stage. Maximum weed density and dry weight was reported under weedy check plot due to heavy infestation during both the years of research (Fig. 1). Among herbicidal treatments, at harvest stage total weed density and dry weight were significantly reduced under sequential

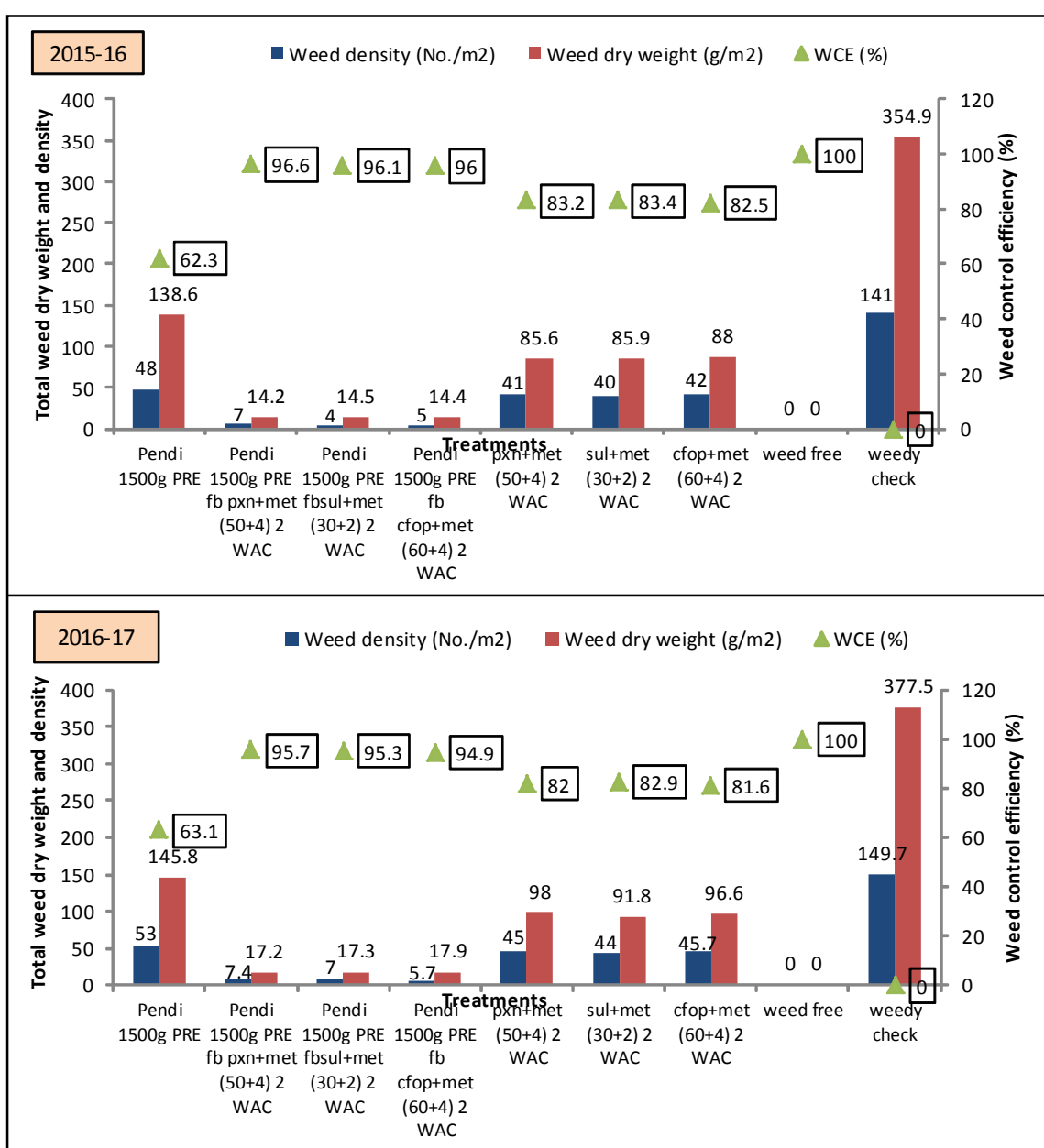


Fig. 1. Effect of different herbicides on total weed density, total dry weight and weed control efficiency (WCE) at harvest stage of dual purpose wheat.

application of pendimethalin 1500 g/ha PRE *fb* pinoxaden + metsulfuron (50+4) 2 WAC (week after cutting at 55 DAS), pendimethalin 1500 g/ha PRE *fb* sulfosulfuron+ metsulfuron (30+2) 2 WAC and pendimethalin 1500 g/ha PRE *fb* clodinafop + metsulfuron (60+4) 2 WAC, but weeds under alone application of post emergence pinoxaden + metsulfuron (50+4) 2 WAC, sulfosulfuron+ metsulfuron (30+2) 2 WAC, clodinafop + metsulfuron (60+4) 2 WAC did not show effective mortality which might be due to a new flush of weeds and aging factor of weeds. As the post emergence spray of herbicides were at 70 DAS (means 2 weeks after cutting), thus even after cutting of weeds with wheat fodder, most of the weeds (remaining part of weeds after cutting) were hardy, so there might be the reason that alone POE herbicidal mixture was less effective against hardy weeds as compared to sequential application of PRE and POE herbicides. The results corroborate with the findings of (Annual report CCS HAU, 2015) that sequential application of pendimethalin 1.5 kg/ha PRE followed by tank mix pinoxaden + metsulfuron 64 g / ha or mesosulfuron + iodosulfuron 14.4 g/ha or sulfosulfuron + metsulfuron(RM) 32 g/ha POE provided excellent control of *P. minor* as well as

broadleaf weeds in wheat field. Dry weight and grassy & broad leaf weed density were increased under pendimethalin 1500 g/ha PRE due to emergence of new flush of weeds during both the years of experimentation.

**Weed control efficiency (WCE) :** During 2015-16 and 2016-17, maximum WCE (100 %) was recorded under weed free plot. At harvest, WCE was found to be highest under sequential application of pendimethalin 1500 g/ha PRE, pendimethalin 1500 g/ha PRE *fb* pinoxaden + metsulfuron (50+4) 2 WAC, pendimethalin 1500 g/ha PRE *fb* sulfosulfuron+ metsulfuron (30+2) 2 WAC and pendimethalin 1500 g/ha PRE *fb* clodinafop + metsulfuron (60+4) 2 WAC, which was statistically higher than weedy check and alone application of pre and post emergence herbicides during both the years.

**Fodder yield as affected by different herbicidal treatments :** Weed control treatments had no significant effect on fodder yield of dual purpose wheat at 55 DAS during both years of study.

**Grain yield and B-C ratio :** Among all

TABLE 1  
Effect of different herbicides on grain yield, test weight and harvest index of dual purpose wheat

Treatments	Dose (g/ha)	Time of application	Fodder yield (kg/ha)	Grain Yield (kg/ha)	Test weight (g)	B : C ratio
<b>2015-16</b>						
Pendimethalin	1500	PRE	3801	2264	42.6	1.76
Pendimethalin <i>fb</i> pinoxaden+metsulfuron	1500 fb (50+4)	PRE fb 2 WAC	3845	2930	43.2	2.08
Pendimethalin <i>fb</i> sulfosulfuron+metsulfuron	1500 fb (30+2)	PRE fb 2 WAC	3822	2990	43.8	2.14
Pendimethalin <i>fb</i> clodinafop+metsulfuron	1500 fb (60+4)	PRE fb 2 WAC	3797	2899	43.2	2.08
Pinoxaden+metsulfuron	50 + 4	2 WAC	3699	2598	42.2	1.96
Sulfosulfuron+metsulfuron	30 + 2	2 WAC	3746	2702	42.7	2.05
Clodinafop+metsulfuron	60 + 4	2 WAC	3723	2641	42.2	2.01
Weed free	-		3837	3089	43.9	1.82
Weedy check	-		3687	1987	40.4	1.65
S. Em±			71.6	96.6	1.03	-
C. D. (P=0.05)			NS	192.2	NS	-
<b>2016-17</b>						
Pendimethalin	1500	PRE	3624	2012	38.2	1.58
Pendimethalin <i>fb</i> pinoxaden+metsulfuron	1500 fb (50+4)	PRE fb 2 WAC	3610	2680	39.4	1.89
Pendimethalin <i>fb</i> sulfosulfuron+metsulfuron	1500 fb (30+2)	PRE fb 2 WAC	3623	2745	39.7	1.95
Pendimethalin <i>fb</i> clodinafop+metsulfuron	1500 fb (60+4)	PRE fb 2 WAC	3641	2647	39.3	1.89
Pinoxaden+metsulfuron	50 + 4	2 WAC	3514	2410	38.6	1.82
Sulfosulfuron+metsulfuron	30 + 2	2 WAC	3487	2485	38.8	1.87
Clodinafop+metsulfuron	60 + 4	2 WAC	3512	2398	38.7	1.82
Weed free	-		3618	2790	39.7	1.62
Weedy check	-		3468	1751	37.9	1.46
S. Em±			83.1	51.4	1.2	-
C. D. (P=0.05)			NS	145.4	NS	-

treatments, at harvest, Statistically significant difference in grain yield and B: C ratio of dual purpose wheat was not observed among weed free treatment and sequential application of pendimethalin 1500 g/ha PRE, pendimethalin 1500 g/ha PRE *fb* pinoxaden + metsulfuron (50+4) 2 WAC, pendimethalin 1500 g/ha PRE *fb* sulfosulfuron+ metsulfuron (30+2) 2 WAC and pendimethalin 1500 g/ha PRE *fb* clodinafop + metsulfuron (60+4) 2 WAC, but these treatments produced significantly higher grain yield than weedy check and alone pre and post emergence application of herbicides during both the years of study (Table 1). Alone application of PRE pendimethalin 1500 g/ha and POE pinoxaden + metsulfuron (50+4) 2 WAC, sulfosulfuron+ metsulfuron (30+2) 2 WAC and clodinafop + metsulfuron (60+4) 2 WAC recorded significantly lower yield during 20115-16 and 2016-17, which might be due to lower efficacy of recommended dose of herbicides on matured weeds.

#### **Pendimethalin residue in wheat fodder**

It was observed that residues of pendimethalin 1500 g/ha PRE in wheat fodder were below maximum

residue limit (MRL) value of 0.05 mg/kg

#### **CONCLUSIONS**

From the present study it may be concluded that sequential application of pendimethalin *fb* POE application of recommended herbicides provided effective control of weeds and higher yield of dual purpose wheat. Pendimethalin herbicide has no residual effect on wheat fodder which can be safely use in dual purpose wheat crop.

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