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# Evaluating bio-efficacy of aclonifen herbicide against diverse weed flora in wheat

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## Abstract
Weeds in wheat crop are usually managed by herbicides in north-western India due to narrow row spacing, labour scarcity, similar morphology of grassy weeds, particular *Phalaris minor*. Further, continuous adoption of same mode of action based herbicides resulted in development of herbicide resistance in wheat associated weeds. Therefore, a field study was carried to at Agronomy Research Farm of CCS Haryana Agricultural University, Hisar during *rabi* 2018-19 and 2019-20 to evaluate the efficacy of aclonifen herbicide against weed flora in wheat. The treatments included different doses of aclonifen 600 SC at 900, 1050, 1200 g/ha as pre-emergence (PE) just after sowing and one day before first irrigation as early post emergence (EPoE) compared with pendimethalin 1500 g/ha PE, post emergence (PoE) application of sulfosulfuron 25 g/ha, untreated control, two hand weeding and weed free. The results indicated that PE and EPoE application of aclonifen 1200 g/ha provided 23.4-22.7% and 28.5-27.8% higher wheat grain yield compared to weedy check. EPoE application of aclonifen 1200 g/ha provided higher control of diverse weeds such as *P. minor*, *M. denticulata*, *C. didymus* and *L. aphaca*, as compared to pendimethalin 1250 g/ha (PE). Application of aclonifen 1200 g/ha resulted in statistically similar grain yield along with pendimethalin 1250 g/ha (4258-4423 kg/ha) as PE and PoE application of sulfosulfuron 25 g/ha (4618-4687 kg/ha).

**Keywords:** Aclonifen, early post emergence, pendimethalin, *Phalaris minor*, wheat

## Introduction
Wheat (*Triticum aestivum* L.) is one of the most important crops among the cereals and staple food of majority of world's population. India is second largest producer of wheat with 12% share in global wheat production after China. The wheat harvest in India during 2022-23 has surpassed 110 million tons (mt)from an area of about 30 million hectares but productivity in India (3.66 t/ha) is lower as compared to countries like China and Mexico (over 6 t/ha) (TAAS, 2024). Out of total wheat area, 42% is under the rice-wheat cropping system in India's western Indo-Gangetic Plains. This region comprises of Punjab, Haryana and Uttar Pradesh, and remark as most dominant wheat-growing area of India. Since there is little scope for expanding the area under wheat cultivation, the focus must shift towards enhancing productivity through the adoption of improved agronomic practices.

Weeds pose a major constraint to crop production due to their strong competitive ability for essential resources such as light, moisture, nutrients, and space. In India, weed infestation has been reported to cause average yield losses of 31.5%, 22.7%, and 36.5% during the rabi (winter), zaid (summer), and kharif (monsoon) seasons, respectively (Rao and Nagamani, 2010) [12]. Average yield losses of 20-30% due to weeds are quite common, while, heavy infestation of these formidable enemies can inflict huge crop losses. Wheat crop is reported to be infested with narrow leaf (grassy and sedges) and broad-leaved weeds. The major grassy weeds of wheat are *Phalaris minor* and *Avena spp.* whereas, broad leaved weeds are *Chenopodium album*, *Rumex sp.*, *Melilotus sp. Anagallis arvensis*, *Vicia sativa*, *Lathyrus aphaca*, *Coronopus didymus and Convolvulus arvensis* (Chaudhary *et al*., 2021 and Punia *et al*., 2017) [2, 11]. Although herbicides are highly effective for weed management, the continuous use of herbicides with the same mode of action can lead to the selection and proliferation of herbicide-resistant weed biotypes in

wheat.
Now *P. minor* has evolved resistance against multiple mode of actions-based herbicides such as Photosystem II inhibitor, Acetyl-coA Carboxylase (ACCase) and Acetolactate synthase inhibitor (Chhokar and Sharma, 2008; Kumar *et al.*, 2024) [4, 8]. Therefore, development and evaluation of new herbicide is essentially required for sustainable herbicide-based weed management in wheat. Keeping all above-mentioned facts and constraints in view, the present study was conducted to study bio-efficacy of aclonifen against different weed flora in wheat.

**Materials and Methods**
The field experiment was conducted during *rabi* seasons of 2018-2019 and 2019-20 at the Agronomy Research Farm, CCS Haryana Agricultural University, Hisar, Haryana, India. The treatments were different doses of aclonifen 600 SC at 900, 1050, 1200 g/ha as pre-emergence (PE) just after sowing and one day before first irrigation as early post emergence (EPoE) compared with pendimethalin 1500 g/ha PE, sulfosulfuron 25 g/ha as PoE, untreated control, two hand weeding and weed free. The experiment was laid out in a randomized complete block design and replicated thrice. The soil of the experimental field was sandy loam with low in organic carbon and available nitrogen, medium in available phosphorus and high in available potassium.
The crop varieties WH 1105 (2018-19) and WH 1124 (2019-20) were sown on 17.11.2018 and 21.11.2019, respectively using 100 kg seed per hectare in 20 cm spaced rows with a seed cum fertilizer drill. The PE herbicides were applied after sowing on 19.11.2018 and 21.11.2019 and early post emergence on 6.12.2018 and 10.12.2019 during 2018-19 and 2019-20, respectively with a knapsack sprayer fitted with a flood jet nozzle calibrated to deliver 500l/ha spray volume. Observation on species wise weed density was recorded at 28 and 56 days after application (DAA) of herbicides from two places in a plot by using quadrate of 0.25 $m^2$ and expressed in terms of number/$m^2$. Weed control efficiency (WCE) was computed by adopting formula given by Mani *et al.* (1973) [9] as follows:

$$WCE\ (\%) = \frac{\mathrm{Wdc} - \mathrm{Wtc}}{\mathrm{Wdc}} \times 100$$

Where, $W_{dc}$ is the weed density in unweeded control/weedy check (no./$m^2$) and $W_{tc}$ is the weed population in treated plot ((no./$m^2$).
Weed index (WI) was computed by adopting the Gill and Kumar (1969) [7]

$$WI\ (\%) = \frac{\mathrm{X} - \mathrm{Y}}{\mathrm{X}} \times 100$$

Where, X = Crop yield from weed free plot (hand weeding) and Y = Crop yield from the treated plot
Data related to plant height and effective tillers were recorded at maturity. Yield from the net plot was recorded and converted into kg/ha. The data were analyzed using analysis of variance to evaluate the differences in treatments, while means were separated using the least significant difference test at the 5% significance level. The data was analyzed using the OPSTAT software (Sheoran *et al*. 1998) [15].

**Results and Discussion**
**Weed density and weed control efficiency**
The crop was mainly infested by grassy weed *Phalaris minor*, while, *Medicago denticulata*, *Coronopus didymus* and *Lathyrus aphaca* were dominated broad leaved weeds in the experimental field during the study (Table 1, 2, 3 and 4). Application of aclonifen 600 SC at different rates and timing significantly reduced the density of different weed species as compared to weedy check during study year. Application of aclonifen 600 SC at 1200 g/ha as EPoE significantly reduced the density (no./$m^2$) of *P. minor* (4.0), *M. denticulata* (14.0), *C. didymus* (11.3) and *L. aphaca* (2.7), which was at statistically at par with two hand weeding at 20 and 40 DAS and aclonifen 1200 g/ha as pre-emergence (5.3, 19.3, 10.0, 3.3, respectively) at 28 days after application (DAA) during 2018-19 (Table 1). Highest weed density was recorded under untreated control conditions with density of different weeds as 22.0, 62.0, 29.3 and 4.6 no./$m^2$, respectively at 28 DAA. Similarly, the aclonifen (1050-1250 g/ha) either as PE or EPoE resulted in significantly lower weed density of different weeds, which was statistically at par with hand weeding (20 and 40 DAS) (Table 2) at 56 DAA. During 2019-20, application of aclonifen 1200 g/ha as PE or EPoE resulted in lower density of *P. minor* (8.7-10), which was at par with hand weeding at 20 and 40 DAS, however, density of *M. denticulata*, *C. didymus* and *L. aphaca* was significantly lower with two hand weeding as compared to other treatments at 28 and 56 DAA (Table 3 and 4).
Weed control efficiency was calculated based on the density of weed species varied with application of different herbicides. Highest weed control efficiency for *P. minor* was recorded with two hand weeding at 20 and 40 DAS, while application of aclonifen 1200 g/ha recorded 83% of *P. minor* control at 56 DAA in 2018-19. Application of aclonifen at different doses resulted in 38.8-74.5, 38.9-68.5 and 33.3-55.6% control of *M. denticulata*, *C. didymus* and *L. aphaca*, respectively during 2018-19 (Table). Similarly, during 2019-20 application of aclonifen moderately controlled different weeds *P. minor* (44.9-73.5%), *M. denticulata* (26.0-58.7%), *C. didymus* (30.6-51.8%) and *L. aphaca* (0.0-50.0) at 56 DAA (Fig. 1 & 2). Reddy *et al.* (2023a) [13] also reported minimum weed density, dry matter accumulation with PE and EPoE application of aclonifen in wheat. Further, PE and EPoE application of aclonifen 600 SC 1200 g/ha recorded similar and higher weed control efficiency (60-66%) as compared to PE application of pendimethalin 1200 g/ha (59%) (Reddy *et al.*, 2023a) [13]. Delchev (2022) [6] also reported the additive effect of aclonifen with other foliar applied herbicides on weed control in lentil.

**Yield attributes and yield**
The data observed on effective tillers, plant height, and grain yield (Table 5) during both the study year showed that aclonifen based treatments significantly affected effective tillers and yield, however, results were non-significant for plant height. Weedy check resulted in significantly lower effective tillers compared to different herbicide treatments and hand weeding at 20 and 40 DAS, however, at par with application of aclonifen 900 g/ha as PE or EPoE. Application of aclonifen 1200 g/ha resulted in higher effective tillers as compared to pendimethalin 1250 g/ha application. The perusal of data in Table 5 showed that the yield of crop was recorded lowest in weedy check (3833 and 3594 kg/ha), while highest in weed free treatment (5467 and 5217 kg/ha) during 2018-19 and 2019-20, respectively. Application of different herbicides resulted in significantly higher crop yield as compared to weedy check, however, application of aclonifen 900 g/ha resulted in statistically at par yield (4075 and 3975 kg/ha) and (4310 and 4044 kg/ha) as PE and EPoE. Application of aclonifen 1200 g/ha PRE resulted in 22.7-23.4 per cent and early post emergence 27.8-28.5per cent higher yield as

compared to untreated.

Reddy *et al*., (2023b) [14] reported the similar findings with the application of aclonifen due to minimum weed infestation and higher weed control efficiency resulting in lesser weed competition from grassy and broadleaf weeds subsequently improved crop growth and grain yield. Application of aclonifen 1200 g/ha resulted in at par yield with pendimethalin 1250 g/ha (4423 and 4258 kg/ha) as PE application and sulfosulfuron 25 g/ha (4687 and 4618 kg/ha) as PoE. Effectiveness of different pre-emergence herbicides in controlling the resistant *P. minor* and broad leaf weeds and higher grain yield of wheat has also been reported by Chhokar *et al.* (2019) [5]; Chaudhary *et al.* (2022) [3] and Kumar *et al.* (2024) [8]. Reddy *et al.* (2023a) [13] also reported higher wheat grain yield (4.27 t/ha) with aclonifen 1200 g/ha as compared to pre -emergence pendimethalin 1200 g/ha (2.89 t/ha).

**Weed index**

Weed index is the percent reduction in yield for a particular treatment due to the presence of weeds in comparison to weed free plot. Highest value of weed index was recorded under weed free while application of aclonifen resulted 9.9-25.5 per cent of weed index at different doses and different timing of application during 2018-19 (Fig. 3). Minimum weed index was reported with aclonifen 1200 g/ha EPoE (9.9%) followed by aclonifen 1200 g/ha PE application (14.0%). However, during 2019-20 application of sulfosulfuron 25 g/ha resulted in lower weed index (11.5%) among different herbicides followed by aclonifen 1200 g/ha as EPoE application (12.0%) (Fig. 3). Two hand weeding at 20 and 40 DAS resulted in lowest weed index of 6.3 and 6.8 per cent during 2018-19 and 2019-20. Higher grain yield and lower weed index of wheat was also reported by Meena *et al.* (2019) [10] and Reddy *et al.* (2023b) [14].

**Table 1:** Effect of different weed control treatments on weeds density (no./m$^2$) at 28 DAA wheat (2018-19)

| Treatment | Doses g/ha | Time | *Phalaris minor* | *Medicago denticulata* | *Coronopus didymus* | *Lathyrus aphaca* |
|---|---|---|---|---|---|---|
| Untreated control | - | - | 4.8 (22.0) | 7.9 (62.0) | 5.5 (29.3) | 2.4 (4.6) |
| Aclonifen 600 SC | 900 | PRE | 3.5 (11.3) | 6.7 (43.3) | 4.2 (16.7) | 2.2 (4.0) |
| Aclonifen 600 SC | 1050 | PRE | 3.0 (8.0) | 5.2 (26.0) | 3.9 (14.7) | 2.1 (3.3) |
| Aclonifen 600 SC | 1200 | PRE | 2.5 (5.3) | 4.5 (19.3) | 3.3 (10.0) | 2.1 (3.3) |
| Pendimethalin 30 EC | 1250 | PRE | 3.1 (8.6) | 5.0 (24.0) | 5.0 (24.0) | 1.9 (2.7) |
| Aclonifen 600 SC | 900 | EPoE | 3.0 (8.0) | 5.9 (34.0) | 4.4 (18.7) | 2.1 (3.3) |
| Aclonifen 600 SC | 1050 | EPoE | 2.9 (7.3) | 4.7 (21.3) | 3.8 (13.3) | 1.9 (2.7) |
| Aclonifen 600 SC | 1200 | EPoE | 2.2 (4.0) | 3.9 (14.0) | 3.5 (11.3) | 1.9 (2.7) |
| Sulfosulfuron 70% | 25 | PoE | 2.5 (5.3) | 4.7 (21.3) | 3.8 (13.3) | 2.1 (3.3) |
| Two hand weeding (20 and 40 DAS) | - | - | 2.2 (4.0) | 3.2 (9.3) | 2.7 (6.7) | 1.5 (1.3) |
| Weed free | - | - | 1.0 (0.0) | 1.0 (0.0) | 1.0 (0.0) | 1.0 (0.0) |
| SEm ± | | | 0.2 | 0.3 | 0.3 | 0.2 |
| CD (*p=0.05*) | | | 0.6 | 0.7 | 0.8 | 0.5 |

**Table 2:** Effect of different weed control treatments weeds density (no./m$^2$) at 56 DAA in wheat (2018-19)

| Treatment | Dose (g/ha) | Time | *Phalaris minor* | *Medicago denticulata* | *Coronopus didymus* | *Lathyrus aphaca* |
|---|---|---|---|---|---|---|
| Untreated control | - | - | 6.5 (42.0) | 7.7 (58.7) | 5.8 (32.7) | 2.4 (4.7) |
| Aclonifen 600 SC | 900 | PRE | 5.1 (24.7) | 5.8 (33.3) | 5.1 (24.7) | 2.2 (4.0) |
| Aclonifen 600 SC | 1050 | PRE | 3.5 (11.3) | 4.7 (21.3) | 4.0 (15.3) | 2.1 (3.3) |
| Aclonifen 600 SC | 1200 | PRE | 3.1 (8.7) | 4.3 (17.3) | 3.4 (10.7) | 1.9 (2.7) |
| Pendimethalin 30% EC | 1250 | PRE | 3.5 (11.3) | 5.4 (28.0) | 5.1 (25.3) | 2.4 (4.7) |
| Aclonifen 600 SC | 900 | EPoE | 4.1 (16.0) | 5.4 (28.0) | 5.0 (24.0) | 2.2 (4.0) |
| Aclonifen 600 SC | 1050 | EPoE | 3.5 (11.3) | 4.8 (22.0) | 3.9 (14.7) | 2.1 (3.3) |
| Aclonifen 600 SC | 1200 | EPoE | 3.0 (8.0) | 4.4 (18.7) | 3.5 (11.3) | 2.1 (3.3) |
| Sulfosulfuron 70% | 25 | PoE | 3.0 (8.0) | 4.9 (22.7) | 4.4 (18.7) | 2.2 (4.0) |
| Two hand weeding 20 and 40 DAS | - | - | 3.1 (8.7) | 4.0 (15.3) | 4.0 (15.3) | 2.1 (3.3) |
| Weed free | - | - | 1.0 (0.0) | 1.0 (0.0) | 1.0 (0.0) | 1.0 (0.0) |
| SEm ± | | | 0.2 | 0.3 | 0.2 | 0.2 |
| CD (*p=0.05*) | | | 0.7 | 0.8 | 0.5 | 0.5 |

*Original data in parenthesis were subjected to square root transformation

**Table 3:** Effect of different weed control treatments on weeds density (no./m$^2$) at 28 DAA in wheat (2019-20)

| Treatment | Dose (g/ha) | Time | *Phalaris minor* | *Medicago denticulata* | *Coronopus didymus* | *Lathyrus aphaca* |
|---|---|---|---|---|---|---|
| Aclonifen 600 SC | 900 | PRE | 4.1 (16.0) | 7.0 (48.7) | 6.2 (37.3) | 2.2 (4.0) |
| Aclonifen 600 SC | 1050 | PRE | 3.7 (12.7) | 5.7 (32.0) | 5.7 (32.0) | 2.4 (4.7) |
| Aclonifen 600 SC | 1200 | PRE | 3.3 (10.0) | 5.3 (26.7) | 5.5 (29.3) | 2.1 (3.3) |
| Pendimethalin 30 EC | 1250 | PRE | 3.1 (8.7) | 5.2 (26.0) | 5.5 (29.3) | 1.9 (2.7) |
| Aclonifen 600 SC | 900 | EPoE | 4.0 (14.7) | 6.9 (47.4) | 6.7 (44.7) | 2.2 (4.0) |
| Aclonifen 600 SC | 1050 | EPoE | 4.0 (14.7) | 6.4 (40.0) | 5.7 (31.3) | 2.5 (5.3) |
| Aclonifen 600 SC | 1200 | EPoE | 3.1 (8.7) | 6.2 (38.0) | 5.8 (33.3) | 2.2 (4.0) |
| Sulfosulfuron 70 WP | 25 | PoE | 3.1 (8.7) | 5.2 (26.7) | 5.6 (30.0) | 2.1 (3.3) |
| Two hand weeding 20 and 40 DAS | - | - | 2.6 (6.0) | 3.7 (13.3) | 3. 0 (8.0) | 1.7 (2.0) |
| Weed free | - | - | 1.0 (0.0) | 1.0 (0.0) | 1.0 (0.0) | 1.0 (0.0) |
| Untreated control | - | - | 5.3 (26.7) | 8.0 (62.7) | 7.9 (61.3) | 2.4 (4.7) |
| SEm ± | | | 0.1 | 0.3 | 0.3 | 0.1 |
| CD (*p=0.05*) | | | 0.3 | 0.8 | 0.8 | 0.4 |

*Original data in parenthesis were subjected to square root transformation

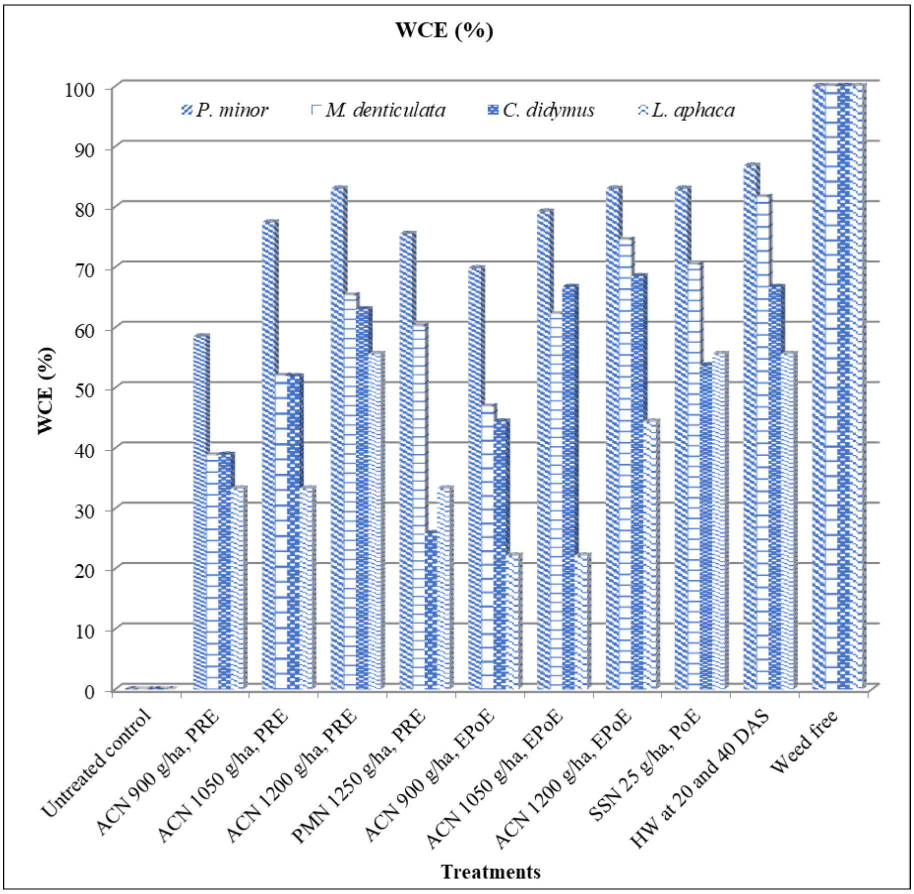
**Table 4:** Effect of different weed control treatments on weeds density (no./m$^2$) at 56 DAA in wheat (2019-20)

| Treatment | Dose g/ha | Time | *Phalaris minor* | *Medicago denticulata* | *Coronopus didymus* | *Lathyrus aphaca* |
|---|---|---|---|---|---|---|
| Aclonifen 600 SC | 900 | PRE | 4.4 (18.0) | 7.2 (51.3) | 6.3 (39.3) | 2.4 (4.7) |
| Aclonifen 600 SC | 1050 | PRE | 3.7 (12.7) | 6.3 (38.7) | 5.7 (31.3) | 2.2 (4.0) |
| Aclonifen 600 SC | 1200 | PRE | 3.5 (11.3) | 5.4 (28.7) | 5.3 (27.3) | 1.9 (2.7) |
| Pendimethalin 30 EC | 1250 | PRE | 3.2 (9.3) | 5.4 (28.0) | 5.7 (31.3) | 2.1 (3.3) |
| Aclonifen 600 SC | 900 | EPoE | 4.1 (16.0) | 7.2 (50.8) | 6.4 (40.7) | 2.4 (4.7) |
| Aclonifen 600 SC | 1050 | EPoE | 4.0 (14.7) | 6.7 (43.3) | 5.4 (28.0) | 2.5 (5.3) |
| Aclonifen 600 SC | 1200 | EPoE | 3.1 (8.7) | 6.2 (38.0) | 5.4 (28.0) | 2.1 (3.3) |
| Sulfosulfuron 70 WP | 25 | PoE | 3.3 (10.0) | 4.9 (23.3) | 5.2 (26.7) | 2.4 (4.7) |
| Two hand weeding at 20 and 40DAS | - | - | 2.2 (4.0) | 3.1 (8.7) | 2.9 (7.3) | 1.5 (1.3) |
| Weed free | - | - | 1.0 (0.0) | 1.0 (0.0) | 1.0 (0.0) | 1.0 (0.0) |
| Untreated control | - | - | 5.8 (32.7) | 8.4 (69.3) | 7.6 (56.7) | 2.5 (5.3) |
| SEm ± | | | 0.2 | 0.2 | 0.3 | 0.2 |
| CD (*p=0.05*) | | | 0.5 | 0.5 | 1.0 | 0.4 |

*Original data in parenthesis were subjected to square root transformation

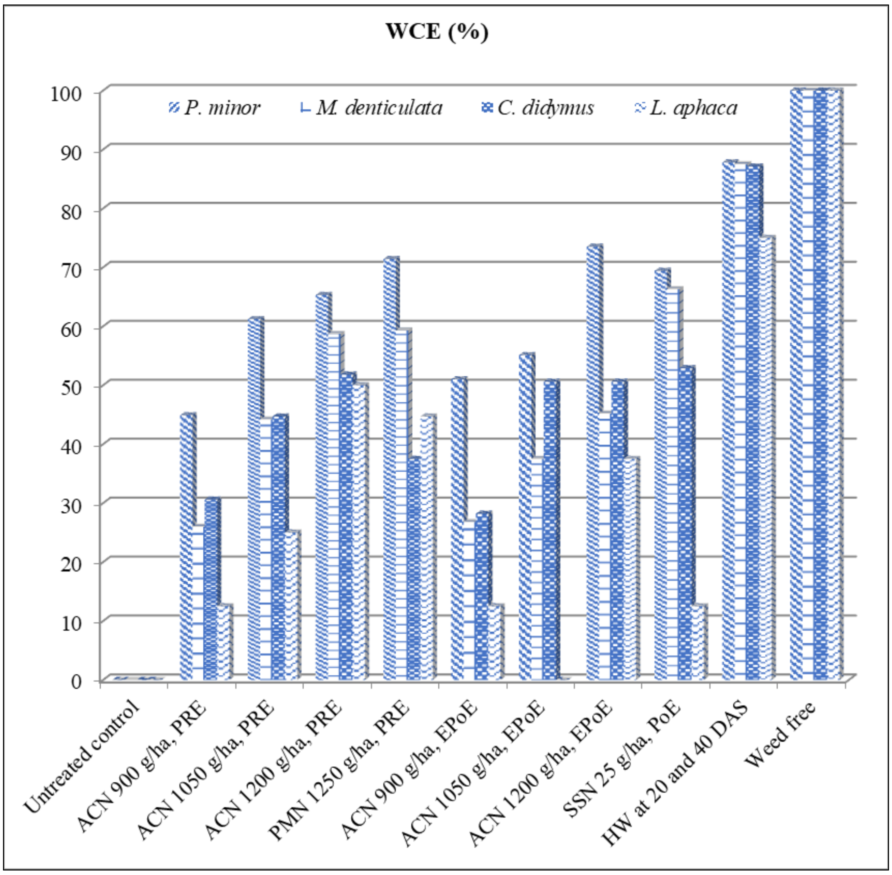
**Table 5:** Effect of different weed control treatments on yield attributes and yield of wheat (2018-19 and 2019-2020)

| Treatment | Dose g/ha | Time | Plant height (cm) | | Effective tillers (no./m$^2$) | | Yield (kg/ha) | |
|---|---|---|---|---|---|---|---|---|
| | | | 2018-19 | 2019-20 | 2018-19 | 2019-20 | 2018-19 | 2019-20 |
| Aclonifen 600 SC | 900 | PRE | 99.3 | 98.3 | 277 | 272 | 4075 | 3975 |
| Aclonifen 600 SC | 1050 | PRE | 98.7 | 100.3 | 299 | 286 | 4514 | 4280 |
| Aclonifen 600 SC | 1200 | PRE | 101.0 | 101.0 | 314 | 299 | 4702 | 4436 |
| Pendimethalin 30 EC | 1250 | PRE | 101.0 | 99.7 | 301 | 292 | 4423 | 4258 |
| Aclonifen 600 SC | 900 | EPoE | 99.7 | 98.0 | 292 | 273 | 4310 | 4044 |
| Aclonifen 600 SC | 1050 | EPoE | 100.3 | 99.7 | 294 | 294 | 4433 | 4322 |
| Aclonifen 600 SC | 1200 | EPoE | 101.0 | 100.7 | 326 | 307 | 4927 | 4593 |
| Sulfosulfuron 70 WP | 25 | PoE | 98.0 | 99.0 | 312 | 315 | 4687 | 4618 |
| Two hand weeding 20 and 40 DAS | - | - | 101.5 | 102.7 | 342 | 326 | 5123 | 4862 |
| Weed free | - | - | 101.7 | 103.0 | 357 | 340 | 5467 | 5217 |
| Untreated control | - | - | 97.0 | 98.0 | 268 | 252 | 3833 | 3594 |
| SEm ± | | | 1.9 | 2.9 | 8.3 | 9.5 | 169 | 170 |
| CD (*p=0.05*) | | | NS | NS | 25 | 28 | 496 | 499 |



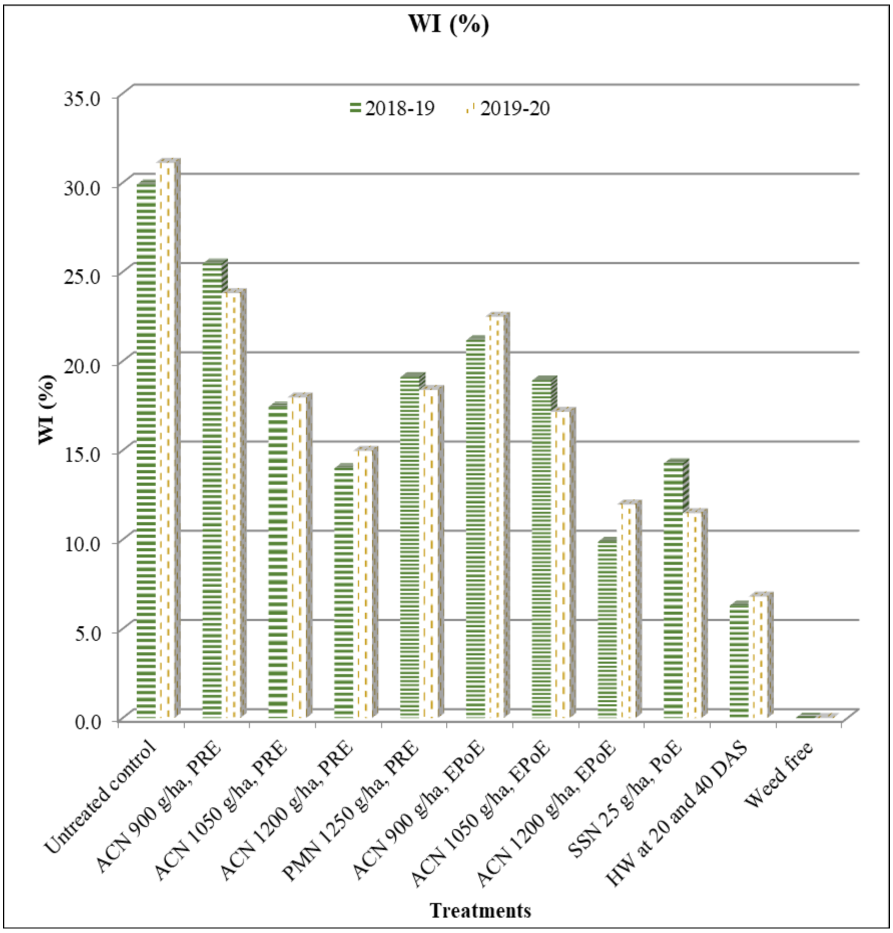

ACN-Aclonifen, PMN-Pendimethalin, SSN-Sulfosulfuron, HW-Hand weeding

**Fig 1:** Effect of different treatments on WCE (%) of different weeds in wheat at 56 DAA during 2018-19




ACN-Aclonifen, PMN-Pendimethalin, SSN-Sulfosulfuron, HW-Hand weeding

**Fig 2:** Effect of different treatments on WCE (%) of different weeds in wheat at 56 DAA during 2019-20




ACN-Aclonifen, PMN-Pendimethalin, SSN-Sulfosulfuron, HW-Hand weeding

**Fig 3:** Effect of different treatments on WI (%) of wheat during 2018-19 and 2019-20

## Conclusion

It can be concluded from this study that aclonifen 600 SC at 1200 g/ha provided effective control of grassy weed *viz. P. minor* and broad-leaved weeds *viz. M. denticulata, C. didymus* and *L. aphaca* weeds over other treatments resulting in 22.7 - 23.4 per cent and 27.8-28.5 per cent higher yield as compared to weedy check during the study years as pre-emergence and early post-emergence application, respectively. Further, pre and early post-emergence application of aclonifen 1200 g/ha provided higher control of diverse weeds as compared to pendimethalin 1250 g/ha.

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## Competing Interests

Authors have declared that no competing interests exist

## References

1. Asif M, Poonia TM, Hooda VS. Effects of herbicides and nano urea mixture on weeds, yield attributes and yield of wheat (*Triticum aestivum*). Int J Environ Clim Chang. 2023;13(12):1211-20.
2. Chaudhary A, Yadav DB, Dhanda S, Poonia TM. *Phalaris minor* management in wheat by post-emergence application of metribuzin based tank-mixed herbicides in north-western Indo-Gangetic Plains. Indian J Weed Sci. 2021;53(3):252-6.
3. Chaudhary A, Yadav DB, Singh S, Poonia TM, Punia SS, Singh N. Bio-efficacy of herbicides with different water volumes and spray timing under zero tillage rice residue retention scenario against *Phalaris minor* in wheat. Int J Plant Soil Sci. 2022;34(20):447-53.
4. Chhokar RS, Sharma RK. Multiple herbicide resistance in littleseed canarygrass (*Phalaris minor*): A threat to wheat production in India. Weed Biol Manag. 2008;8:112-23.
5. Chhokar RS, Sharma RK, Gill SC, Singh GP. Flumioxazin and Flufenacet as possible options for the control of multiple herbicide-resistant little seed canarygrass (*Phalaris minor* Retz.) in wheat. Weeds-Journal of the Asian-Pacific Weed Science Society. 2019;1(2):45-60.
6. Delchev G. Efficacy of herbicides, herbicide combinations and herbicide tank mixtures on lentil (*Lens culinaris* Medik.). Agric Sci Technol. 2022;14(3):40-8.
7. Gill GS, Kumar V. Weed index, a new method for reporting weed control trials. Indian J Agron. 1969;142:96-8.
8. Kumar S, Dadarwal RS, Mal T, Akshit, Devi P, Kumar P, *et al*. Microtubules assembly inhibitors in combination with PPO, ACCase and ALS inhibitors herbicides for the management of multiple herbicide-resistant *Phalaris minor* in wheat under Indo-Gangetic Plains: a threat to sustainable wheat production. Acta Physiol Plant. 2024;46(4):40.
9. Mani VS, Malla ML, Gautam KC, Das B. Weed killing chemical in potato cultivation. Indian Farming. 1973;23(1):17-8.
10. Meena V, Kaushik MK, Dotaniya ML, Meena BP, Das H. Bio-efficacy of ready-mix herbicides on weeds and productivity in late-sown wheat. Indian J Weed Sci. 2019;51(4):344-51.
11. Punia SS, Singh S, Yadav DB, Sindhu VK, Duhan A. Abundance, distribution and diversity of weeds in wheat in Haryana. Indian J Weed Sci. 2017;49(2):187-90.
12. Rao AN, Nagamani A. Integrated Weed Management in India-Revisited. Indian J Weed Sci. 2010;42(3 & 4):123-35.
13. Reddy MB, Nanda A, Manichandana V, Kumar A, Reddy GP, Singh NK, *et al*. Weed management studies in wheat (*Triticum aestivum* L.) through new herbicide molecule Aclonifen 600 SC under climate changing era. Int J Environ Clim Chang. 2023a;13(9):1311-20.
14. Reddy MB, Singh UP, Upadhyay A, Verma K, Singh NK, Mahapatra D, *et al*. Evaluation of aclonifen 600SC a broad-spectrum herbicide molecule to control canary grass (*Phalaris minor* (Retz.) Pers.) in wheat crop. Environ Ecol. 2023b;41(3D):2193-202.
15. Sheoran OP, Tonk DS, Kaushik LS, Hasija RC, Pannu RS. Statistical software package for agricultural research workers. In: Hooda DS, Hasija RC, editors. Recent Advances in Information Theory, Statistics and Computer Applications. Department of Mathematics & Statistics, CCS HAU; 1998. p. 139-43.