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Research Paper

Impact of integrated weed management on weeds and yield of direct-seeded rice (*Oryza sativa*)

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ABSTRACT

A field investigation was conducted during the rainy season of 2014 and 2015 at Varanasi, Uttar Pradesh, to study the impact of integrated weed management on weeds and yield of direct-seeded rice (*Oryza sativa* L.). At 30, 60, 90 days after sowing (DAS) and harvesting, amongst the integrated weed-management treatments, penoxsulam 35 g/ha at 10 DAS followed by (*fb*) 1 hand-weeding at 35 DAS reduced the weed density of grasses, sedges and broad-leaf weeds and their dry weight than penoxsulam 35 g/ha at 20 DAS *fb* 1 hand-weeding at 35 DAS, thus resulting in the lowest weed index. Penoxsulam 35 g/ha at 10 DAS *fb* 1 hand weeding at 35 DAS exhibited the highest weed-control efficiency over rest of the treatments except hand-weeding at 15 and 35 DAS. Penoxsulam 35 g/ha at 10 DAS *fb* 1 hand-weeding at 35 DAS statistically influenced the grain and straw yields and harvest index over all other treatments except hand-weeding at 15 and 35 DAS. Also the highest net return and benefit: cost ratio were observed under penoxsulam 35g/ha at 10 DAS *fb*1 hand-weeding at 35 DAS.

***Key words*:** Azimsulfuron, Bispyribac Na, Chlorimuron ethyl, Direct-seeded rice, Economics, Metsulfuron methyl, Penoxsulam

Upland rice productivity is very low due to heavy weed infestation. Yield loss due to weeds in direct-seeded upland rice varied from 40 to 100% (Choubey *et al.,* 2001), depending on the weed flora, their density and duration of competition. Manual weeding is not only labour-intensive but their timely availability is a big problem. Chemical control proved to be a viable strategy with higher economic returns (Khaliq *et al.,* 2012). Ehsanullah *et al.* (2012) observed that, the post-emergence application of bispyribac sodium was the most effective in reducing the total density and dry weight over weedy, followed by penoxsulam. However, weeds in direct-seeded rice (DSR) cannot be controlled by herbicide alone due to various flushes of weeds during the life-cycle of crop. Now-a-day, the use of herbicides is gaining popularity in rice fields owing to their rapid effects and the lower costs compared with the traditional methods. But continuous use of herbicides alone at higher dose may lead to the problems of residual toxicity, besides causing a shift in weed flora. Dependence on manual weed control alone is time-consuming and costly. Hence, integrated weed management practices offers most practical and cost-effective means of reducing weed competition in aerobic rice (Mahajan and Chauhan, 2013). Herbicides having relatively broad-spectrum killing may require less man-days and will have better economics in an integrated weed management system. Integrated weed management (IWM) systems have the potential to reduce herbicide use and (associated costs) and to provide more robust weed management over the long term (Swanton and Weise, 1991). Therefore, a study involving integrated weed management in direct seeded rice (DSR) was conducted to assess the suitable integration of different herbicides along with manual weeding on weeds and yields of rice.

MATERIALS AND METHODS

A field experiment was conducted during the rainy seasons of 2014 and 2015 at Agricultural Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (25°18'N, 88°36'E 128.93 m above the mean sea–level), Uttar Pradesh. The soil was sandy clay loam, with *p*H 7.40, low in available organic carbon (0.41%), available nitrogen (207.47 kg/ha) and medium in available phosphorus (23.85 kg/ha) and potassium (219.60 kg/ha).

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The experiment was laid out in a randomized block design, comprising 10 treatments, replicated thrice, viz. bispyribac Na 25 g/ha at 10 DAS followed by (*fb*) 1 hand-weeding (HW) at 35 days after sowing (DAS), bispyribac Na 25 g/ha at 20 DAS *fb* 1 HW at 35 DAS, bispyribac Na 12.5 g/ha + azimsulfuron 15 g/ha at 10 DAS *fb* 1 HW at 35 DAS, bispyribac Na 12.5 g/ha + azimsulfuron 15 g/ha at 20 DAS *fb* 1 HW at 35 DAS, bispyribac Na 12.5 g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 10 DAS *fb* 1 HW at 35 DAS, bispyribac Na 12.5 g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 20 DAS *fb* 1 HW at 35 DAS, penoxsulam 35 g/ha at 10 DAS *fb* 1 HW at 35 DAS, penoxsulam 35 g/ha at 20 DAS *fb* 1 HW at 35 DAS, hand-weeding at 15 and 35 DAS and weedy, during both the years. Rice variety 'MTU 7029' was sown by zero-till drill in the last week of June during both the years, using seed rate of 30 kg/ha and 20 cm row-row spacing. A recommended dose of fertilizer (150 kg N, 60 kg P_2O_5 and 60 kg K_2O) was applied through urea, single superphosphate and muriate of potash during both the years. Full dose of P and K were applied basal, while N was applied half basal and the remaining in 2 equal splits– at tillering and panicle-initiation stages of rice.Application of alone and tank-mixed post-emergence herbicides was done according to the treatments using knap-sack sprayer fitted with flat-fan nozzle. The spray volume of post-emergence herbicides was 300 litres/ha. The crop was raised under irrigated condition under the recommended package of practices. Species-wise weed density and their dry weight were measured at 30, 60, 90 DAS and at harvesting by placing a quadrate of 0.50 m ´ 0.50 m randomly at 2 places in each plot. Data on weed density and dry weight were subjected to square-root transformation before analysis. At 30, 60, 90 DAS and at harvesting, weed-control efficiency (Tripathi and Mishra, 1971) and weed index (Gill and Kumar, 1969) were calculated using weed dry weight and grain yield respectively. Biometric characters viz. yields (grain and straw) of crop were recorded at harvesting. Prevailing price of inputs in the market during 2014 and 2015 were used to calculate the economics of integrated weed-management treatments. Net returns and benefit: cost ratio (BCR) were worked out on the basis of gross returns (₹/ha) and cost of cultivation (₹/ha). Statistical Package for the Social Sciences (SPSS) version 22 was utilized to analyze the observations and differences among treatment means were further grouped into significant classes by Duncan Multiple Range Test (DMRT) (Gomez and Gomez, 1984) at 5% probability. The biometric data on weed growth and yield averaged for 2 years for statistical analysis.

RESULTS AND DISCUSSION

Weeds

Density of grasses, sedges and broad-leaf weeds and their dry weight varied statistically at 30, 60, 90 DAS and at harvesting irrespective of integrated weed-management treatments (Tables 1, 2 and 3). At 30, 60, 90 DAS and at harvesting, penoxsulam 35 g/ha at 10 DAS *fb* 1 HW at 35 DAS recorded lower weed density of grasses than penoxsulam 35 g/ha at 20 DAS *fb* 1 HW at 35 DAS and both treatments were statistically similar to each other except at 30 DAS. Penoxsulam 35 g/ha at 10 DAS *fb* 1 HW at 35 DAS resulted in lower weed density of sedges and broad-leaf weeds than penoxsulam 35 g/ha at 20 DAS *fb* 1 HW at 35 DAS and both treatments were statistically at par to each other. This could be attributed to alone application of penoxsulam 35 g/ha had effective control of both narrow and broad-leaf weeds at early crop stages and later on 1 manual weeding controlled weeds comprehensively. Our view supported that of Dalamas *et al.* (2006). However, bispyribac Na 25 g/ha at 10 DAS *fb* 1 HW at 35 DAS resulted in lesser weed density of grasses than bispyribac Na 25 g/ha at 20 DAS *fb* 1 HW at 35 DAS and both the treatments were statistically similar to each other except 30 DAS (Table 1). Bispyribac Na 25 g/ha at 10 DAS *fb* 1 HW at 35 DAS had lesser weed density of sedges and broad-leaf weeds than bispyribac Na 25 g/ha at 20 DAS *fb* 1 HW at 35 DAS; however, both these treatments were statistically at par (Tables 2 and 3).

At 30, 60, 90 DAS and at harvesting, penoxsulam 35 g/ha at 10 DAS *fb* 1 HW at 35 DAS recorded lower weed dry weight of grasses, sedges and broad-leaf weeds than penoxsulam 35 g/ha at 20 DAS *fb* 1 HW at 35 DAS and both treatments were statistically at par during both the years. However, bispyribac Na 12.5 g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 10 DAS *fb* 1 HW at 35 DAS showed lesser weed dry weight of grasses, sedges and broad-leaf weeds than that recorded with bispyribac Na 12.5g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 20 DAS *fb* 1 HW at 35 DAS and both the treatments were statistically similar to each other (Table 1, 2 and 3). These results confirm the findings of Khare *et al*. (2014) in DSR.

At 30, 60, 90 DAS and at harvesting, penoxsulam 35 g/ha at 10 DAS *fb* 1 HW at 35 DAS exhibited higher weed-control efficiency than penoxsulam 35 g/ha at 20 DAS *fb* 1 HW at 35 DAS, bispyribac Na 12.5 g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 10 DAS *fb* 1 HW at 35 DAS, bispyribac Na 12.5 g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 20 DAS *fb* 1 HW at 35 DAS, bispyribac Na 12.5 g/ha + azimsulfuron 15 g/ha at

Table 1. Effect of weed management on weed density and dry weight of grasses at different stages in direct-seeded rice (average data of 2 years)

Treatment	Density (No./m^2)				Dry weight (g/m^2)			
	30 DAS	60 DAS	90 DAS	At harvesting	30 DAS	60 DAS	90 DAS	At harvesting
Bispyribac Na 25 g/ha at 10 DAS *fb* 1 HW at 35 DAS	2.3(4.9)	2.3(4.8)	2.3(4.8)	3.6(4.0)	1.7(2.6)	1.8(2.7)	1.9(3.0)	2.8(2.2)
Bispyribac Na 25 g/ha at 20 DAS *fb* 1 HW at 35 DAS	2.5(5.6)	2.3(4.9)	2.3(4.9)	3.8(4.8)	1.8(2.9)	1.8(2.7)	1.9(3.0)	2.9(2.6)
Bispyribac Na 12.5 g/ha + azimsulfuron 15 g/ha at 10 DAS *fb* 1 HW at 35 DAS	2.6(6.4)	2.3(4.9)	2.3(4.9)	4.1(5.6)	1.9(3.3)	1.8(2.8)	1.9(3.0)	3.1(3.0)
Bispyribac Na 12.5 g/ha + azimsulfuron 15 g/ha at 20 DAS *fb* 1 HW at 35 DAS	2.8(7.5)	2.3(5.0)	2.3(4.9)	4.4(6.6)	2.1(3.9)	1.8(2.8)	1.9(3.0)	3.3(3.5)
Bispyribac Na 12.5 g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 10 DAS *fb* 1 HW at 35 DAS	3.0(8.3)	2.3(5.0)	2.3(5.0)	4.7(7.6)	2.2(4.4)	1.8(2.8)	1.9(3.0)	3.6(4.1)
Bispyribac Na 12.5 g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 20 DAS *fb* 1 HW at 35 DAS	3.1(9.1)	2.4(5.0)	2.4(5.0)	5.0(8.8)	2.3(4.8)	1.8(2.8)	1.9(3.1)	3.7(4.6)
Penoxsulam 35 g/ha at 10 DAS*fb* 1 HW at 35 DAS	1.9(3.2)	2.3(4.7)	2.3(4.7)	3.1(2.9)	1.5(1.7)	1.8(2.6)	1.8(2.9)	2.4(1.6)
Penoxsulam 35 g/ha at 20 DAS *fb* 1 HW at 35 DAS	2.1(4.0)	2.3(4.8)	2.3(4.8)	3.4(3.9)	1.6(2.2)	1.8(2.7)	1.9(2.9)	2.6(2.1)
Hand-weeding at 15 and 35 DAS	0.7(0.0)	0.7(0.0)	0.7(0.0)	0.71(0.0)	0.7(0.00)	0.7(0.0)	0.7(0.0)	0.7(0.00)
Weedy	5.5(29.5)	5.6(31.2)	6.0(35.3)	11.0(43.3)	4.1(16.6)	5.0(24.4)	4.5(20.0)	8.2(24.1)
SEm±	0.1	0.0	0.0	0.9	0.0	0.0	0.0	0.7
CD (P=0.05)	0.1	0.1	0.0	2.9	0.1	0.1	0.0	2.1

Data were subjected to square root ($\sqrt{X+0.5}$) transformation; figures in parentheses are original values
DAS, Days after sowing; fb, followed by; HW, hand-weeding

Table 2. Effect of weed management on weed density and dry weight of sedges at different stages in direct-seeded rice (average data of 2 years)

Treatment	Density (No./m^2)				Dry weight (g/m^2)			
	30 DAS	60 DAS	90 DAS	At harvesting	30 DAS	60 DAS	90 DAS	At harvesting
Bispyribac Na 25 g/ha at 10 DAS *fb* 1 HW at 35 DAS	1.9(3.1)	1.4(1.5)	1.4(1.5)	1.7(2.5)	1.6(2.2)	1.2(1.0)	1.2(1.0)	1.5(1.8)
Bispyribac Na 25 g/ha at 20 DAS *fb* 1 HW at 35 DAS	2.0(3.7)	1.4(1.5)	1.4(1.5)	1.9(3.0)	1.8(2.6)	1.3(1.1)	1.3(1.1)	1.6(2.1)
Bispyribac Na 12.5 g/ha + azimsulfuron 15 g/ha at 10 DAS *fb* 1 HW at 35 DAS	2.2(4.4)	1.4(1.5)	1.4(1.5)	2.0(3.7)	1.9(3.1)	1.3(1.1)	1.3(1.1)	1.8(2.6)
Bispyribac Na 12.5 g/ha + azimsulfuron 15 g/ha at 20 DAS *fb* 1 HW at 35 DAS	2.2(4.5)	1.4(1.5)	1.4(1.6)	2.1(4.0)	1.9(3.2)	1.3(1.1)	1.3(1.1)	1.8(2.8)
Bispyribac Na 12.5 g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 10 DAS *fb* 1 HW at 35 DAS	2.4(5.2)	1.4(1.6)	1.4(1.6)	2.2(4.4)	2.0(3.7)	1.3(1.1)	1.3(1.1)	1.9(3.1)
Bispyribac Na 12.5 g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 20 DAS *fb* 1 HW at 35 DAS	2.4(5.4)	1.4(1.6)	1.4(1.6)	2.3(4.7)	2.1(3.8)	1.3(1.1)	1.3(1.1)	2.0(3.3)
Penoxsulam 35 g/ha at 10 DAS *fb* 1 HW at 35 DAS	1.6(2.1)	1.4(1.4)	1.4(1.4)	1.6(1.9)	1.4(1.5)	1.2(1.0)	1.2(1.0)	1.4(1.4)
Penoxsulam 35 g/ha at 20 DAS *fb* 1 HW at 35 DAS	1.7(2.5)	1.4(1.5)	1.4(1.5)	1.6(2.2)	1.5(1.8)	1.2(1.0)	1.2(1.0)	1.4(1.5)
Hand-weeding at 15 and 35 DAS	0.7(0.0)	0.7(0.0)	0.7(0.0)	0.71(0.0)	0.7(0.0)	0.7(0.0)	0.7(0.0)	0.7(0.0)
Weedy	3.8(14.2)	4.1(16.2)	4.9(23.5)	4.9(23.6)	3.3(10.1)	3.7(13.5)	4.1(16.7)	4.2(16.8)
SEm±	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CD (P=0.05)	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.1

Data were subjected to square root ($\sqrt{X+0.5}$) transformation; figures in parentheses are original values
DAS, Days after sowing; fb, followed by; HW, hand-weeding

Table 3. Effect of weed management on weed density and dry weight of broad leaf at different stages in direct-seeded rice (average data of 2 years)

Treatment	Density (no./m²)				Dry weight (g/m²)			
	30 DAS	60 DAS	90 DAS	At harvesting	30 DAS	60 DAS	90 DAS	At harvesting
Bispyribac Na 25 g/ha at 10 DAS *fb* 1 HW at 35 DAS	2.3(5.0)	1.7(2.5)	1.7(2.5)	2.2(4.5)	1.8(2.8)	1.3(1.3)	1.3(1.3)	1.7(2.4)
Bispyribac Na 25 g/ha at 20 DAS *fb* 1 HW at 35 DAS	2.5(5.8)	1.7(2.5)	1.7(2.5)	2.4(5.3)	1.9(3.1)	1.4(1.3)	1.4(1.3)	1.8(2.8)
Bispyribac Na 12.5 g/ha + azimsulfuron 15 g/ha at 10 DAS *fb* 1 HW at 35 DAS	2.7(6.7)	1.8(2.6)	1.8(2.6)	2.5(6.0)	2.0(3.6)	1.4(1.4)	1.4(1.4)	1.9(3.2)
Bispyribac Na 12.5 g/ha + azimsulfuron 15 g/ha at 20 DAS *fb* 1 HW at 35 DAS	2.8(7.3)	1.8(2.6)	1.8(2.6)	2.7(6.7)	2.1(4.0)	1.4(1.4)	1.4(1.4)	2.0(3.6)
Bispyribac Na 12.5 g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 10 DAS *fb* 1 HW at 35 DAS	3.0(8.4)	1.8(2.6)	1.8(2.6)	2.9(7.7)	2.2(4.3)	1.4(1.4)	1.4(1.4)	2.1(4.0)
Bispyribac Na 12.5 g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 20 DAS *fb* 1 HW at 35 DAS	3.0(8.6)	1.8(2.7)	1.8(2.7)	3.0(8.3)	2.2(4.4)	1.4(1.4)	1.4(1.4)	2.2(4.3)
Penoxsulam 35 g/ha at 10 DAS *fb* 1 HW at 35 DAS	2.0(3.6)	1.7(2.4)	1.7(2.4)	2.0(3.4)	1.5(1.9)	1.3(1.3)	1.3(1.3)	1.5(1.8)
Penoxsulam 35 g/ha at 20 DAS *fb* 1 HW at 35 DAS	2.2(4.3)	1.7(2.5)	1.7(2.5)	2.1(3.8)	1.7(2.3)	1.3(1.3)	1.3(1.3)	1.6(2.0)
Hand-weeding at 15 and 35 DAS	0.7(0.0)	0.7(0.0)	0.7(0.0)	0.7(0.0)	0.7(0.0)	0.7(0.0)	0.7(0.0)	0.7(0.0)
Weedy	4.5(19.3)	5.2(26.7)	5.9(34.3)	6.0(35.6)	3.3(10.3)	4.2(17.0)	4.8(22.5)	4.4(19.0)
SEm±	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CD (P=0.05)	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Data were subjected to square root ($\sqrt{X + 0.5}$) transformation; figures in parentheses are original values
DAS, Days after sowing; fb, followed by; HW, hand-weeding

10 DAS *fb* 1 HW at 35 DAS, bispyribac Na 12.5 g/ha + azimsulfuron 15 g/ha at 20 DAS *fb* 1 HW at 35 DAS, bispyribac Na 25 g/ha at 10 DAS *fb* 1 HW at 35 DAS, bispyribac Na 25 g/ha at 20 DAS *fb* 1 HW at 35 DAS and weedy (Table 4).

Yield

Penoxsulam 35 g/ha at 10 DAS *fb*1 HW at 35 DAS showed better performance in respect of yields owing to marked reduction in competition for growth resources due to reduction in weed density and weed dry weight (Table 1, 2 and 3). Integrated weed-management treatments exhibited significant variation in yields (grain and straw) (Table 4). Amongst the IWM treatments, penoxsulam 35 g/ha at 10 DAS *fb* 1 HW at 35 DAS revealed the lowest weed index except hand-weeding at 15 and 35 DAS. Penoxsulam 35 g/ha at 10 DAS *fb* 1 HW at 35 DAS had the highest grain yield over rest of the treatments except hand-weeding at 15 and 35 DAS. Penoxsulam 35 g/ha at 10 DAS *fb* 1 HW at 35 DAS and penoxsulam 35 g/ha at 20 DAS *fb*1 HW at 35 DAS resulted in 114.8 and 103.8% increase in grain yield over weedy. This was owing to higher harvest index than weedy and the other integrated weed-management treatments.

Economics

The gross returns obtained by yield of crop varied significantly due to different treatments, which ultimately influenced the net returns and benefit: cost ratio. Penoxsulam 35 g/ha at 10 DAS *fb* 1 HW at 35 DAS provided higher gross returns than penoxsulam 35 g/ha at 20 DAS *fb* 1 HW at 35 DAS and both treatments were statistically similar to each other. Consequently, the highest net returns and benefit: cost ratio were observed under penoxsulam 35 g/ha at 10 DAS *fb*1 HW at 35 DAS (Table 4). This could be attributed to higher grain yield of rice along with less labour and time required for manual weeding reducing cost of cultivation. The results confirm the findings of Sairamesh *et al.* (2015) in DSR.

Based on these findings, it may be concluded that penoxsulam @ 35 g/ha at 10 days after sowing (DAS) followed by (fb) 1 hand-weeding at 35 days after sowing should be applied for effective control of weeds, higher yield and net returns in direct-seeded rice.

Table 4. Effect of integrated weed management on weed-control efficiency, yields, weed index, harvest index and economics of direct-seeded rice (average of 2 years)

Treatment	Weed control efficiency (%)				Grain yield (t/ha)	Straw yield (t/ha)	Weed index (%)	Harvest index (%)	Gross returns (× 10^3 ₹/ha)	Net returns (× 10^3 ₹/ha)	Benefit: cost ratio (₹/ha)
	30 DAS	60 DAS	90 DAS	At harvest							
Bispyribac Na 25 g/ha at 10 DAS *fb* 1 HW at 35 DAS	79.0	90.4	91.6	88.6	4.5	6.1	12.8	42.7	74.0	34.7	1.8
Bispyribac Na 25 g/ha at 20 DAS *fb* 1 HW at 35 DAS	76.0	90.3	91.5	87.0	4.4	6.0	13.4	42.5	73.5	34.8	1.9
Bispyribac Na 12.5 g/ha + azimsulfuron 15 g/ha at 10 DAS *fb* 1 HW at 35 DAS	72.6	90.2	91.4	85.1	4.6	6.1	10.9	43.1	75.5	36.9	1.9
Bispyribac Na 12.5g/ha + azimsulfuron 15g/ha at 20 DAS *fb* 1 HW at 35 DAS	69.7	90.1	91.3	83.0	4.5	6.0	11.8	42.9	74.8	35.5	1.9
Bispyribac Na 12.5 g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 10 DAS *fb* 1 HW at 35 DAS	66.5	90.0	91.2	80.9	4.7	5.8	8.7	44.6	76.9	39.9	2.1
Bispyribac Na 12.5 g/ha + (chlorimuron ethyl + metsulfuron methyl) 2 g/ha at 20 DAS *fb* 1 HW at 35 DAS	64.4	89.9	91.0	79.2	4.6	6.0	9.8	43.5	76.3	38.7	2.0
Penoxsulam 35 g/ha at 10 DAS *fb* 1 HW at 35 DAS	85.3	90.7	91.8	91.4	5.0	6.2	2.5	45.0	82.0	43.7	2.1
Penoxsulam 35 g/ha at 20 DAS *fb* 1 HW at 35 DAS	82.5	90.5	91.7	90.3	4.7	6.2	7.5	43.6	78.2	39.4	2.0
Hand-weeding at 15 and 35 DAS	100.0	100.0	100.0	100.0	5.1	6.1	0.0	45.8	83.9	37.9	1.8
Weedy	0.0	0.0	0.0	0.0	2.3	3.3	54.6	41.6	3.8	7.4	1.2
SEm±	–	–	–	–	0.1	0.2	-	0.6	1.2	1.2	0.04
CD (P=0.05)	–	–	–	–	0.2	0.5	-	1.8	3.8	3.8	0.1

Data were subjected to square root ($\sqrt{X+0.5}$) transformation; figures in parentheses are original values

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