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Effect of weed management practices on growth and weed parameters in rice (*Oryza sativa* L.) nursery

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Abstract
The field experiment was carried out during the *kharif* season of 2019 at Regional Research Station, Anand Agriculture University, Anand to study the effect of weed management practices on growth parameters and weed parameters in rice (*Oryza sativa* L.) nursery. The experiment was laid out in randomized block design with three replications which consist 14 treatments *viz.*, T_1: Pendimethalin @ 750 g/ha PPI, T_2: Pendimethalin @ 750 g/ha PE, T_3: Pendimethalin @ 750 g/ha PPI *fb* Bispyribac sodium @ 20 g/ha PoE, T_4: Pendimethalin 750 g/ha PE *fb* Bispyribac sodium @ 20 g/ha PoE, T_5: Pretilachlor @ 500 g/ha PE, T_6: Anilofos @ 300 g/ha PE, T_7: Oxadiargyl @ 90 g/ha PE, T_8: Ethoxysulfuron @ 15 g/ha PoE, T_9: Bispyribac sodium @ 20 g/ha PoE, T_{10}: Metsulfuron methyl + Chlorimuron ethyl @ 4 g/ha PoE, T_{11}: Penoxsulam @ 20 g/ha PoE, T_{12}: Rabbing of farm waste @ 10 t/ha, T_{13}: Hand weeding at 15 DAS and T_{14}: Weedy check. The result revealed that hand weeding at 15 DAS registered higher number of germinated seedlings, number of seedlings, transplantable seedlings, fresh weight and dry weight of rice seedlings. Penoxsulam @ 20 g/ha PoE recorded highest height, root and shoot length of rice seedlings. The lowest weed count, total weed fresh weight, total weed dry weight and highest weed control efficiency were recorded under hand weeding at 15 DAS. Among the herbicidal treatments, lowest weed count, minimum total weed fresh weight, minimum total weed dry weight and maximum weed control efficiency were obtained under application of penoxsulam @ 20 g/ha PoE followed by metsulfuron methyl + chlorimuron ethyl @ 4 g/ha PoE.

Keywords: Rice nursery, herbicides, weed management

Introduction
Rice (*Oryza sativa* L.) is the most important staple food crop of the India, next to wheat feeding more than half of the world's population every day. In Asia, it has a special significance, where about 90 per cent of the rice is produced and consumed as a staple food. In India, rice occupying an area of 43.99 million hectares with production of 110 million tonnes with an average productivity of 2.49 tonnes/ha (Anon., 2018) [1]. There are three seasons for growing rice in India, but in Gujarat, rice is grown in *kharif* and summer seasons where assured irrigation facility is available.

Weeds are the major constraints in raising healthy nursery of rice. Weeds compete with the nursery seedlings and results in poor rice transplantable seedlings. If not controlled, these weed seedlings are transplanted along with rice seedlings and these grown up weed plants compete with crop and result in more than 50% reduction in crop yield causing big financial loss to the growers. The dominant weed species were observed in the rice nurseries were *Echinochloa crusgalli* and *Echinochloa colona*. Weed control in rice nursery is one of the most important factors for raising a healthy nursery. Hand weeding is very easy and environment friendly but tedious and highly labour intensive and drudgery in doing. Hand weeding is not effective method where some of the rice associated weeds like *Echinochloa crusgalli* and *Echinochloa colona*, due to similarities between weeds and rice seedlings, it could not be separated. In such situations the chemical weed control method becomes an alternative method for weed control. Chemical weeding with the application of pre-emergence and post-emergence herbicides is vital tool for effective weed control in rice nursery. Evaluation of new herbicides with low dose and high efficiency which will not only reduce the total volume of herbicides but also application becomes easier and economical to farmers. These new molecules control the wide spectrum of mixed weed flora. Rice seedlings are very sensitive, and hence, selectivity, dose and time of application of herbicides are more important to avoid its phytotoxic effect and increase weed control efficiency.

Materials and Methods

Background of study: The field experiment was conducted during the year of 2019 in the *kharif* season at Regional Research Station, Anand Agricultural University, Anand, Gujarat. Anand is situated at 22˚-35' N latitude and 72˚-55' E longitude with an altitude of 45.1 m above mean sea level. The climate of this region is semi-arid and subtropical with fairly dry and hot summer, fairly cold and dry winter and moderately humid monsoon. The experimental site was low in organic carbon (0.43%) and nitrogen (172 kg/ha), while medium in available phosphorus (28.43 kg/ha) and potassium (215 kg/ha). Rice variety GAR 13 was sown by broadcasting with seed rate of 25 kg/ha. The crop was fertilized with nitrogen (100 kg/ha) and phosphorus (25 kg/ha) as a basal application through ammonium sulphate and DAP at the time of sowing. The crop was also fertilized with $ZnSO_4$ 5 kg/ha, $FeSO_4$ 5 kg/ha and vermicompost applied 2 t/ha.

Experimental design

The experiment was laid out in randomized block design with three replications which consist 14 treatments *viz.*, T_1: Pendimethalin @ 750 g/ha PPI, T_2: Pendimethalin @ 750 g/ha PE, T_3: Pendimethalin @ 750 g/ha PPI *fb* Bispyribac sodium @ 20 g/ha PoE, T_4: Pendimethalin 750 g/ha PE *fb* Bispyribac sodium @ 20 g/ha PoE, T_5: Pretilachlor @ 500 g/ha PE, T_6: Anilofos @ 300 g/ha PE, T_7: Oxadiargyl @ 90 g/ha PE, T_8: Ethoxysulfuron @ 15 g/ha PoE, T_9: Bispyribac sodium @ 20 g/ha PoE, T_{10}: Metsulfuron methyl + Chlorimuron ethyl @ 4 g/ha PoE, T_{11}: Penoxsulam @ 20 g/ha PoE, T_{12}: Rabbing of farm waste @ 10 t/ha, T_{13}: Hand weeding at 15 DAS and T_{14}: Weedy check.

Weed management practices and efficacy evaluation

Herbicides were applied as a spray with the help of knapsack sprayer fitted with the flat fan nozzle with the spray volume of 500 lit/ha while hand weeding treatment was done at 15 DAS. Rabbing was done by burning about 10 tonnes/ha farm waste and mixed with the soil with the help of iron rake. Species wise weed count was recorded at 25 DAS by using 0.25 m^2 quadrate two times and then expressed as (no./m^2). Weed samples were collected from each plot by using 0.25 m^2 quadrate at 25 DAS and air dried for 48 hours and then oven dried at 70^0c till the constant weight and expressed as (g/m^2). The weed control efficiency for each treatment was calculated by using the following formula (Kondap and Upadhyay, 1985) [4].

$$WCE\ (\%) = \frac{DWC - DWT}{DWC} \times 100$$

Where

WCE = Weed control efficiency in percent
DWC = Dry weight of weeds in weedy check plot
DWT = Dry weight of weeds in treated plot

Data collection and statistical analysis

The number of germinated rice seedlings, healthy rice seedlings and transplanted rice seedlings were taken by using 0.25 m^2 quadrate randomly from two places in each plot at 10, 25 DAS and at the time of uprooting, respectively and expressed as (no./m^2). For fresh weight, rice seedlings were collected by using 0.25 m^2 quadrate from each plot and fresh weight (g/m^2) after washing the soil adhering to the rice seedlings was recorded. After recording the fresh weight of rice seedlings, one kilogram of fresh material was taken from each plot and allowed to sun dry for 48 hours. Then oven dried at 70 ^{0}C temperature till the constant weight was obtained to determine the dry weight of rice seedlings. At random ten rice seedlings were chosen from each plot, plant height and shoot length was measured in cm from the base of the plant to the apex of the shoot, while root length was measured from base of the plant to the tip of the root at 25 DAS. The data collected were subjected to statistical analysis in Randomized Block Design following the method of (Cochran and Cox, 1967) [2]. The variances of different sources of variation in ANOVA were tested by "F-test" and compared with the value of Table-F at 5% level of significance. In case of observations on weed density and weed dry weight the normality of distribution was not seen and hence, the values were subjected to $\sqrt{x+0.5}$ transformed prior to statistical analysis.

Results and Discussion

Effect on growth parameters

Data presented in Table 1 indicated that growth parameters of rice seedlings were significantly influenced by different treatments. Hand weeding at 15 DAS registered higher number of germinated seedlings (1270/m^2), number of seedlings (1265/m^2), transplantable seedlings (868/m^2), fresh weight (1203/m^2) and dry weight (344/m^2) of rice seedlings. Among the herbicides penoxsulam @ 20 g/ha PoE recorded higher number of germinated seedlings (1266/m^2), number of seedlings (1249/m^2), transplantable seedlings (801/m^2), fresh weight (1149 g/m^2) and dry weight (328 g/m^2) of rice seedlings (Table 1). It could be attributed due to the penoxsulam check all categories of weed growth like grasses, sedges and broad leaf weeds which provide weed free environment thus better growth of seedlings without any weed competition. Based on the mean data, application of penoxsulam @ 20 g/ha PoE recorded highest height (33.77 cm), root length (7.64 cm) and shoot length (33.77 cm) of rice seedlings (Table 1). It might be due to that this treatment kept the crop weed free which reduced the competition for the moisture, space, light. While minimum number of germinated seedlings (279/m^2), number of seedlings (275/m^2), transplantable seedlings (53/m^2), fresh weight (76 g/m^2) and dry weight (22 g/m^2) of rice seedlings, lower height (16.03 cm), root length (3 cm) and shoot length (16.03 cm) of rice seedlings were observed under pendimethalin @ 750 g/ha PPI followed by pendimethalin @ 750 g/ha PPI *fb* bispyribac sodium @ 20 g/ha PoE (Table 1). It could be attributed due to the harmful effect of pendimethalin on rice seedlings when applied as pre plant incorporation.

Table 1: Effect of weed management practices on growth parameters of rice seedlings.

Treatments	Germination count (no./m^2) at 10 DAS	Number of rice seedling (no./m^2) at 25 DAS	Transplantable seedling (no./m^2)	Fresh weight of seedling (g/m^2) at 25 DAS	Dry weight of seedling (g/m^2) at 25 DAS	Height of seedling (cm) at 25 DAS	Root length of seedling (cm) at 25 DAS	Shoot length of seedling (cm) at 25 DAS
T_1: Pendimethalin 38.7% CS 750 g/ha PPI	279^{d}	257^{h}	53^{h}	76 ^{j}	22^{j}	16.03^{i}	3^{h}	16.03^{i}
T_2: Pendimethalin 30% EC 750 g/ha PE	970^{b}	900^{d}	661^{cde}	672^{cde}	192^{cde}	28.76^{cd}	6.13^{c}	28.76^{cd}
T_3: Pendimethalin 38.7% CS 750 g/ha PPI *fb* Bispyribac sodium 10% EC 20 g/ha PoE	353^{d}	336^{h}	91^{h}	152^{ij}	43^{ij}	18.06^{i}	3.30^{h}	18.06^{i}
T_4: Pendimethalin 30% EC 750 g/ha PE *fb* Bispyribac sodium 10% EC 20 g/ha PoE	1033^{b}	951^{cd}	707^{bcd}	726^{cd}	207^{cd}	29.69^{b}	6.33^{bc}	29.69^{bc}
T_5:Pretilachlor 50% EC 500 g/ha PE	667^{c}	641^{fg}	477^{fg}	377^{fgh}	108^{fgh}	22.48^{gh}	4.33^{fg}	22.48^{gh}
T_6:Anilofos 30% EC 300 g/ha PE	758^{c}	739^{ef}	567^{ef}	477^{efg}	136^{efg}	25.29^{ef}	5.18^{de}	25.29^{ef}
T_7: Oxadiargyl 80% WP 90 g/ha PE	579^{c}	567^{g}	415^{g}	313^{ghi}	89^{ghi}	20.89^{h}	4.01^{g}	20.89^{h}
T_8:Ethoxysulfuron 15% WDG 15 g/ha PoE	1145^{ab}	807de	617de	541^{def}	155^{def}	26.53^{def}	5.35^{de}	26.53^{def}
T_9: Bispyribac sodium 10% EC 20 g/ha PoE	1149^{ab}	853de	634^{cde}	615de	176de	27.60^{cde}	5.55^{d}	27.60^{cde}
T_{10}:Metsulfuron methyl 10%+Chlorimuron ethyl 10% WP 4 g/ha PoE	1150^{ab}	1202^{ab}	787^{ab}	1071^{ab}	306^{ab}	32.11^{ab}	6.89^{b}	32.11^{ab}
T_{11}: Penoxsulam 21.7% SC 20 g/ha PoE	1266^{a}	1249^{a}	801^{ab}	1149^{a}	328^{a}	33.77^{a}	7.64^{a}	33.77^{a}
T_{12}: Rabbing of farm waste 10 t/ha	1085^{ab}	1080^{bc}	728^{bc}	870^{bc}	249^{bc}	31.50^{ab}	6.54^{bc}	31.50^{ab}
T_{13}: Hand weeding at 15 DAS	1270^{a}	1265^{a}	868^{ab}	1203^{a}	349^{a}	25.63^{ef}	5.42^{d}	25.63^{ef}
T_{14}: Weedy check	1265^{a}	504^{g}	388^{g}	251^{hij}	72^{hij}	24.77^{fg}	4.83^{ef}	24.77^{fg}
S.Em. +	59.24	47.34	32.34	60.49	17.28	0.77	0.17	0.77
CD 5%	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
C. V.%	11.08	10.11	10.06	17.27	17.27	5.14	5.48	5.14

Figures in parentheses are means of original values. Data subjected to transformation ($\sqrt{x+0.5}$). Treatment means with the letters in common are not significant by DNMRT test at 5% level of significance.

Effect on weed parameters

Weed flora of the experimental plot was mainly dominated by *Echinochloa crusgalli*, *Echinochloa colona*, *Digitaria sanguinalis*, *Dactyloctenium aegyptium*, *Ecilpta alba*, *Phyllanthus niruri* and *Cyperus rotundus* presented in Table 2. Among all the treatments hand weeding at 15 DAS recorded lowest weed count (no./m^2). Among the herbicidal treatments, lowest weed count (no./m^2) of *Echinochloa crusgalli* (1.00/m^2), *Echinochloa colona* (1.18/m^2), *Digitaria sanguinalis* (1.47/m^2), *Dactyloctenium aegyptium* (1.00/m^2), *Ecilpta alba* (1.00/m^2), *Phyllanthus niruri* (1.00/m^2) and *Cyperus rotundus* (1.79/m^2) at 25 DAS were recorded in experimental plot with application of penoxsulam @ 20 g/ha PoE followed by metsulfuron methyl + chlorimuron ethyl @ 4 g/ha PoE (Table 2). Similar results were findings with the Gopinath and Kundu (2008) [3], Mahajan *et al.* (2008) [5], Prakash *et al.* (2013) [7], and Singh *et al.* (2016) [8].

Table 2: Effect of weed management practices on weed count species wise (no./m^2) in rice nursery.

Treatments	*Echinochloa crusgalli*	*Echinochloa colona*	*Digitaria sanguinalis*	*Dactyloctenium aegyptium*	*Ecilpta alba*	*Phyllanthus niruri*	*Cyperus rotundus*
T_1: Pendimethalin 38.7% CS 750 g/ha PPI	4.29^{b} (17.90)	4.88^{ab} (23.31)	4.37^{ab} (18.60)	3.79^{ab} (13.86)	7.23^{ab} (51.77)	5.69^{a} (31.88)	9.33^{b} (86.55)
T_2: Pendimethalin 30% EC 750 g/ha PE	2.47^{fg} (5.60)	3.24^{ef} (9.99)	2.73^{ef} (6.95)	1.65^{ef} (2.22)	2.58^{efg} (6.16)	3.06^{ef} (8.86)	3.97^{h} (15.26)
T_3: Pendimethalin 38.7% CS 750 g/ha PPI *fb* Bispyribac sodium 10% EC 20 g/ha PoE	3.97^{bc} (15.26)	4.71^{abc} (21.68)	4.02^{abc} (15.66)	3.47^{b} (11.54)	6.89^{ab} (46.97)	5.40^{ab} (28.66)	8.69^{bc} (75.02)
T_4: Pendimethalin 30% EC 750 g/ha PE *fb* Bispyribac sodium 10% EC 20 g/ha PoE	1.95^{g} (3.30)	2.96^{f} (8.26)	2.08^{fg} (3.83)	1.47^{fg} (1.66)	1.79^{fgh} (2.70)	2.26^{fg} (4.61)	3.18^{h} (9.61)
T_5: Pretilachlor 50% EC 500 g/ha PE	3.23^{cdef} (9.93)	3.79^{cdef} (13.86)	3.43^{cde} (11.26)	2.50^{cd} (5.75)	4.80^{cd} (22.54)	4.05^{cde} (15.90)	6.57^{ef} (42.66)
T_6:Anilofos 30% EC 300 g/ha PE	3.13^{def} (9.30)	3.78^{cdef} (13.79)	3.29^{cde} (10.32)	2.34^{cde} (4.97)	3.92^{de} (14.87)	3.80^{de} (13.86)	5.98^{fg} (35.26)
T_7: Oxadiargyl 80% WP 90 g/ha PE	3.67^{bcd} (12.97)	4.43^{bcd} (19.12)	3.76^{abcd} (13.64)	3.38^{b} (10.92)	6.32^{abc} (39.44)	5.18^{abc} (26.33)	8.23^{cd} (67.23)
T_8: Ethoxysulfuron 15% WDG 15 g/ha PoE	3.34^{cde} (10.65)	4.29^{bcd} (17.90)	3.63^{bcd} (12.75)	3.06^{bc} (8.86)	5.71^{bc} (32.10)	4.38^{bcd} (18.68)	7.75^{cd} (59.56)
T_9: Bispyribac sodium 10% EC 20 g/ha PoE	3.33^{cde} (10.58)	4.04^{bcde} (15.82)	3.44^{cde} (11.33)	3.01^{bc} (8.56)	5.27^{cd} (27.27)	4.33^{bcd} (18.25)	7.33^{de} (53.33)
T_{10}: Metsulfuron methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha PoE	1.18^{h} (0.89)	1.97^{g} (3.38)	1.61^{g} (2.09)	1.29^{fg} (1.16)	1.47^{gh} (1.66)	1.61^{gh} (2.09)	3.01^{h} (8.56)
T_{11}: Penoxsulam 21.7% SC 20 g/ha PoE	1.00^{h} (0.5)	1.18^{gh} (0.89)	1.47^{g} (1.66)	1.00^{fg} (0.5)	1.00^{h} (0.5)	1.00^{h} (0.5)	1.79^{i} (2.70)
T_{12}: Rabbing of farm waste 10 t/ha	2.73^{efg} (6.95)	3.52^{def} (11.89)	3.13^{de} (9.30)	1.68^{def} (2.32)	3.06^{ef} (8.86)	3.34^{def} (10.65)	5.33^{g} (27.91)

T_{13}: Hand weeding at 15 DAS	0.71^{h} (0.00)	0.71^{h} (0.00)	0.71^{h} (0.00)	0.71^{g} (0.00)	1.00^{h} (0.5)	0.71^{h} (0.00)	0.71^{i} (0.00)
T_{14}: Weedy check	6.25^{a} (38.56)	5.71^{a} (32.10)	4.58^{a} (20.48)	4.55^{a} (20.20)	7.67^{a} (58.33)	6.31^{a} (39.32)	10.44^{a} (108.49)
S.Em. +	0.24	0.3	0.24	0.25	0.45	0.35	0.31
CD 5%	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
C. V.%	13.94	14.66	13.65	18.1	18.71	16.45	9.03

Minimum total fresh weight (1.67 g/m^2), total weed dry weight (1.15 g/m^2) and maximum weed control efficiency (99.09%) at 25 DAS were achieved under hand weeding at 15 DAS. Among the herbicides minimum total fresh weight (6.66 g/m^2), total weed dry weight (3.61/m^2) and maximum weed control efficiency (90.61%) was obtained under application of penoxsulam @ 20 g/ha PoE followed by metsulfuron methyl + chlorimuron ethyl @ 4 g/ha PoE (Table 3). It might be due to that penoxsulam inhibited the plant enzyme acetolactase synthase (ALS), which was involved in biosynthesis of the branched amino acids. The ALS compounds inhibit the production of the amino acids like valine, leucine and isoleucine in plants by binding to the ALS enzyme. Without these amino acids, protein synthesis and growth inhibited, which ultimately causing plant death. These results correspond with the findings reported by Prakash *et al.* (2013) [7] and Masthanareddy *et al.* (2016) [6]. The highest weed count (no./m^2) of species wise of *Echinochloa crusgalli* (6.25/m^2), *Echinochloa colona* (5.71/m^2), *Digitaria sanguinalis* (4.58/m^2), *Dactyloctenium aegyptium* (4.55/m^2), *Ecilpta alba* (7.67/m^2), *Phyllanthus niruri* (6.31/m^2), *Cyperus rotundus* (10.44/m^2) total fresh weight (21.71/m^2) and total weed dry weight (11.62/m^2) were obtained under weedy check. Among the herbicides highest weed count (no./m^2) of *Echinochloa crusgalli* (4.29/m^2), *Echinochloa colona* (4.88/m^2), *Digitaria sanguinalis* (4.37/m^2), *Dactyloctenium aegyptium* (3.79/m^2), *Ecilpta alba* (7.23/m^2), *Phyllanthus niruri* (5.69/m^2), *Cyperus rotundus* (9.33/m^2), total weed fresh weight (20.49/m^2), total dry weight (10.97/m^2) and minimum weed control efficiency (10.76%) at 25 DAS were recorded with application of pendimethalin @ 750 g/ha PPI (Table 2 and 3). It might be due to that application of pendimethalin as PPI was found be less effective to control weed flora in rice nursery which accumulated highest dry matter and in case of weedy check, there was no any weed control measure was taken which leads to greater number of weed density.

Table 3: Effect of weed management practices on total fresh weight, total weed dry weight and weed control efficiency.

Treatments	Total fresh weight of weeds (g/m^2) at 25 DAS	Total dry weight of weeds (g/m^2) at 25 DAS	Weed control efficiency (%)
T_1: Pendimethalin 38.7% CS 750 g/ha PPI	20.49^{ab} (419.34)	10.97^{ab} (119.84)	10.76
T_2: Pendimethalin 30% EC 750 g/ha PE	13.41^{h} (179.33)	7.19^{h} (51.19)	61.95
T_3: Pendimethalin 38.7% CS 750 g/ha PPI *fb* Bispyribac sodium 10% EC 20 g/ha PoE	19.42^{bc} (376.64)	10.4^{bc} (107.66)	20.01
T_4: Pendimethalin 30% EC 750 g/ha PE *fb* Bispyribac sodium 10% EC 20 g/ha PoE	12.68^{h} (160.28)	6.8^{h} (45.74)	66
T_5: Pretilachlor 50% EC 500 g/ha PE	16.47^{efg} (270.76)	8.82^{efg} (77.29)	42.56
T_6:Anilofos 30% EC 300 g/ha PE	15.97^{fg} (254.54)	8.56^{fg} (72.77)	45.98
T_7: Oxadiargyl 80% WP 90 g/ha PE	18.19^{cd} (330.38)	9.74^{cd} (94.37)	29.88
T_8: Ethoxysulfuron 15% WDG 15 g/ha PoE	17.87^{cde} (318.84)	9.57^{de} (91.08)	32.27
T_9: Bispyribac sodium 10% EC 20 g/ha PoE	17.23^{def} (296.37)	9.23^{def} (84.69)	37.15
T_{10}: Metsulfuron methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha PoE	11.04^{i} (121.38)	5.93^{i} (34.66)	74.26
T_{11}: Penoxsulam 21.7% SC 20 g/ha PoE	6.66^{j} (43.85)	3.61^{j} (12.53)	90.61
T_{12}: Rabbing of farm waste 10 t/ha	15.3^{g} (233.59)	8.2^{g} (66.74)	50.45
T_{13}: Hand weeding at 15 DAS	1.67^{k} (2.29)	1.15^{k} (0.82)	99.09
T_{14}: Weedy check	21.71^{a} (470.87)	11.62^{a} (134.52)	-
S.Em. +	0.46	0.23	
CD 5%	Sig.	Sig.	
C. V.%	5.35	5.04	

*Figures in parentheses are means of original values. Data subjected to transformation ($\sqrt{x+0.5}$). Treatment means with the letters in common are not significant by DNMRT test at 5% level of significance.

Conclusions

In the light of above experimental results, it can be concluded that effective weed management could be obtained under application of penoxsulam @ 20 g/ha PoE followed by metsulfuron methyl + chlorimuron ethyl @ 4 g/ha PoE.

References

1. Anonymous. Pocket book of agriculture statistics, Directorate of Economics & Statistics, New Delhi, India, 2018, 24-26.
2. Cochran WG, Cox GM. Experimental Designs. John Willey and Sons. Inc. New York, 1967, 546-68.
3. Gopinath KA, Kundu S. Evaluation of metsulfuron-methyl and chlorimuron-ethyl for weed control in direct seeded rice. Indian Journal of Agricultural Sciences. 2008;78(5):84-87.
4. Kondap SM, Upadhyay UC. A practical manual on weed control. Oxford and IBH Publisher, New Delhi, 1985, 55.
5. Mahajan G, Chauhan BS. Performance of Penoxsulam for Weed Control in Transplanted Rice. Pest Technology. 2008;2(2):114-16.
6. Masthanareddy BG, Guruprasad GS, Mahantashivayogavya DP, Gowdar SB, Sridhar D. Bioefficay of penoxsulam 24% SC herbicide against weeds in direct seeded rice under puddled condition. Journal of Farm Science. 2016;29(3):337-39.

7. Prakash C, Shivran RK, Koli NR. Bio efficacy of new herbicides in transplanted rice. Indian Journal of Weed Science. 2013;45(4):282-84.
8. Singh R, Singh SP, Singh VP, Sirazuddin Verma H, Shukla DK. Weed control in direct seeded rice with penoxsulam. International Journal of Basic and Applied Agricultural Research. 2016;14(3):379-382.