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Major nutrient uptake by weeds and crop in herbicide applied transplanted rice

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Abstract
An experiment was conducted during *kharif*, 2013 and 2014 at Hyderabad with 14 treatments consisting of pre emergence application of pretilachlor 625 g, pyrazosulfuron 20 g and bensulfuron methyl 60g+pretilachlor 600 g at 3 DAT, penoxulam 22.5 g and cyhalofop-p-butyl 100 as early post emergence at 15 DAT, bispyribacsodium 25 g and pretilachlor 750 g their combinations with ethoxy sulfuron 18.75g, metsulfuron methyl+ chlorimuron ethyl 4g, azimsulfuron 35g, pyrazosulfuron 20 g ha^{-1} at 3DAT followed by hand weeding at 25 DAT, hand weeding twice at 25 and 45 DAT and weedy check in RBD replicated thrice. During both years of investigation, Significantly the higher nitrogen, phosphorus and potassium uptake of crop was observed with T_{13} treatment (hand weeding twice at 25 and 45 DAT) and was comparable with T_4 (pyrazosulfuron ethyl @ 20 g a.i. ha^{-1} at 3 DAT followed by manual weeding at 25 DAT), T_{12} (pretilachlor @ 750 g a.i. ha^{-1} as PE at 3 DAT followed by metsulfuron methyl + chlorimuron ethyl @ 4 g a.i.ha^{-1} as PoE at 25 DAT) and T_{10} treatments (bispyribac sodium @ 20 g a.i. ha^{-1}+ metsulfuron methyl + chlorimuron ethyl @ 4 g a.i. ha^{-1} as PoE at 25 DAT).

Keywords: Major nutrient uptake, weeds, crop, herbicide applied transplanted rice

Introduction
Rice is one of the most important food grains produced and consumed all over the world. Globally, India stands first in rice area and second in production after China. It is also a staple food for more than 65% of the Indian population, accounts for more than 42% of food production. In India, rice is grown in an area of 44.1 million ha, with a production of 106.64 million tonnes with a productivity of 2416 kg ha^{-1} (Ministry of Agriculture, 2014-15). Contributes 21.5% of global rice production. In Telangana state, area under rice crop is 2.00 million ha, with a production of 6.62 million tonnes and productivity of 3297 kg ha^{-1} (DES, Hyderabad, 2014-15). Rice crop suffers from various biotic and abiotic production constraints. Weed competition is one of the major yield limiting factors among biotic constraints in rice. The reduction in paddy yield due to weed competition ranges from 9-51 % (Mani *et al*., 1986) [7]. Herbicide technology offers an alternative method of selective and economical control of weeds right from the beginning, giving crop an advantage of good start and competitive superiority. So measure of uptake of nutrients by crop and weed is useful in examining impact of applied herbicides on nutrient removal. Hence keeping in view of the above study was carried out.

Materials and methods
An investigation was carried out during kharif 2013 and 2014 at college farm, College of Agriculture, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad. The soil of the experimental site was sandy clay loam in texture, neutral in reaction, low in available nitrogen, high in available phosphorus and available potassium.
The experiment was laid out in randomized block design with fourteen weed management practices T1: pretilachlor @ 625 g a.i. ha-1 as PE at 3 DAT, T2: pyrazosulfuron ethyl @ 20 g a.i. ha-1 3 DAT, T3: pretilachlor 6% + bensulfuron methyl 0.6% @ 10 kg granules ha-1 as PE at 3 DAT, T4: pyrazosulfuron ethyl @ 20 g a.i. ha-1 at 3 DAT followed by manual weeding at 25 DAT, T5: penoxsulam @ 22.5 g a.i. ha-1 as PoE at 12 DAT, T6: cyhalofop-p-butyl @ 100 g a.i. ha-1 as PoE 15 DAT, T7: bispyribac sodium @ 25 g a.i. ha-1 as PoE 25 DAT, T8: azimsulfuron @ 35 g a.i. ha-1 as PoE at 25 DAT, T9: bispyribac sodium @ 25 g a.i. ha-1 + ethoxy sulfuron 18.75 g a.i. ha-1 as PoE at 25 DAT, T10:bispyribac sodium @ 20 g a.i. ha-1 +

metsulfuron methyl + chlorimuron ethyl @ 4 g a.i. ha-1 as PoE at 25 DAT, T11: pretilachlor @ 750 g a.i. ha-1 as PE at 3 DAT fb ethoxy sulfuron @ 18.75 g a.i. ha-1 as PoE at 25 DAT, T12: pretilachlor @ 750 g a.i. ha-1 as PE at 3 DAT fb metsulfuron methyl + chlorimuron ethyl @ 4 g a.i. ha-1 as PoE at 25 DAT, T13: hand weeding twice at 25 and 45 DAT and T14: weedy check.

Chemical Analysis

3.9.1 Soil analysis

Prior to initiation of experiment, composite soil samples were collected from experimental field at random for a depth of 0-30 cm. The soil sample was analyzed for physico chemical characteristics and available N, P and K as per the standard procedures (Jackson, 1973) [6]. The samples were shade dried, powdered, sieved through two mm sieve and then analyzed for available nutrients.

3.9.2 Nutrient uptake by crops and weeds

Crop and weed samples collected at 60 DAT and at harvest stage from individual plots were dried under shade and then oven dried, powdered in a Willy mill and separately analyzed as per the standard procedures (Jackson, 1973) [6]. Uptake of N, P and K was worked out by multiplying their percent content with their respective dry matter weights and expressed in kg ha^{-1}.

Total nutrient uptake was determined by the following formula

$$\text{Nutrient uptake (kg ha}^{-1}) = \frac{\text{Percentage of nutrient} \times \text{Total dry matter production (kg ha}^{-1})}{100}$$

Table 3.1. Physico-chemical properties of soil in the experimental field

Soil samples were collected from the experimental field at random from 0-30 cm depth and analyzed for physical and chemical properties by adopting standard procedures. The values of physical and chemical properties are presented in table

S. No.	Particulars	Value	Method of analysis
1.	Physical properties		
	Mechanical analysis		
	Sand (%)	60	Bouyoucos hydrometer
	Silt (%)	18	
	Clay (%)	22	
	Textural class		Sandy clay loam
2.	Physico-chemical properties		
	pH	7.9	Combined electrode method
	EC (dS m^{-1})	0.26	Conductivity Meter
3.	Chemical properties		
	Organic carbon (%)	0.41	Walkley and Black method
	Available nitrogen (kg N ha^{-1})	225.6	Alkaline permanganate method
	Available phosphorus (kg P ha^{-1})	27.14	Olsen's extractant method
	Available potassium (kg K ha^{-1})	169.76	Neutral ammonium acetate method

Results and Discussions

Nutrient Studies

4.5.1 Nutrient uptake by crop (N, P and K)

Nutrient uptake is the function of nutrient concentration and biomass accumulation. The nutrient uptake (kg ha^{-1}) of rice increased linearly with the ontogeny of the crop growth. The data pertaining to effect of different weed management practices on nutrient uptake (N, P and K) of rice recorded at 60 DAT and at harvest were presented in Table 1 and 2.

Significantly the higher N, P and K uptake of crop was observed with T_{13} treatment (hand weeding twice at 25 and 45 DAT) and was comparable with T_4 (pyrazosulfuron ethyl @ 20 g a.i. ha^{-1} as PE at 3 DAT followed by manual weeding at 25 DAT), T_{12} (pretilachlor @ 750 g a.i. ha^{-1} as PE at 3 DAT followed by metsulfuron methyl + chlorimuron ethyl @ 4 g a.i. ha^{-1} as PoE at 25 DAT) and T_{10} treatments (bispyribac sodium @ 20 g a.i. ha^{-1} + metsulfuron methyl + chlorimuron ethyl @ 4 g a.i. ha^{-1} as PoE at 25 DAT) and superior over other treatments. T_{11} treatment (pretilachlor @ 750 g a.i. ha^{-1} as PE at 3 DAT followed by ethoxysulfuron @ 18.75 g a.i. ha^{-1} as PoE at 25 DAT) was statistically at par with T_8 (azimsulfuron @ 35 g a.i. ha^{-1} as PoE at 25 DAT), T_9 (bispyribac sodium @ 25 g a.i. ha^{-1} + ethoxysulfuron @ 18.75 g a.i. ha^{-1} as PoE at 25 DAT) and T_3 treatments (pretilachlor 6% + bensulfuron methyl 0.6% @ 10 kg granules ha^{-1} as PE at 3 DAT). The lower nitrogen uptake of crop was noticed with T_{14} (weedy check), which was on par with remaining other weed management practices viz., T_5, T_2, T_7, T_1 and T_6 at 60 DAT and harvest during both the years of study.

In the present experiment due to better availability of resources that maintained the favorable environment for the crop with limited competition from weeds and availability of nutrients throughout the growth stages leading to better uptake of nutrients

Table 1: Nutrient uptake (N, P and K) by rice as influenced by weed management practices at 60 DAT

S. No.	Treatments	N (kg ha^{-1})		P (kg ha^{-1})		K (kg ha^{-1})	
		2013	2014	2013	2014	2013	2014
T_1	Pretilachlor @ 625 g a.i ha^{-1} as PE at 3 DAT	53.47	55.69	7.40	9.05	51.32	50.12
T_2	Pyrazosulfuron ethyl @ 20 g a.i ha^{-1} 3 DAT	54.50	56.52	7.76	9.94	52.66	51.99
T_3	Pretilachlor 6% + bensulfuron methyl 0.6% @ 10 kg granules ha^{-1} as PE at 3 DAT	64.82	70.24	9.00	10.41	60.31	59.41
T_4	Pyrazosulfuron ethyl @ 20 g a.i ha^{-1} at 3 DAT followed by manual weeding at 25 DAT	75.60	84.47	10.87	13.42	64.56	61.27
T_5	Penoxsulam @ 22.5 g a.i ha^{-1} as early PoE at 12 DAT	56.79	58.98	8.71	9.52	54.17	51.28
T_6	Cyhalofop-p-butyl @ 100 g a.i ha^{-1} as early PoE 12 DAT	52.30	54.78	6.34	8.30	50.81	48.92
T_7	Bispyribac sodium @ 25 g a.i ha^{-1} as PoE 25 DAT	54.60	56.97	7.85	10.12	52.61	50.06

T_8	Azimsulfuron @ 35 g a.i ha^{-1} as PoE at 25 DAT	64.98	71.76	8.13	10.50	59.98	57.45
T_9	Bispyribac sodium @ 25 g a.i ha^{-1} + ethoxysulfuron 18.75 g a.i ha^{-1} as PoE at 25 DAT	65.58	73.82	9.44	11.22	59.85	58.40
T_{10}	Bispyribac sodium @ 20 g a.i ha^{-1} + metsulfuron methyl + chlorimuron ethyl @ 4 g a.i ha^{-1} as PoE at 25 DAT	72.38	80.95	10.00	11.53	60.24	58.99
T_{11}	Pretilachlor @ 750 g a.i ha^{-1} as PE at 3 DAT followed by ethoxysulfuron @ 18.75 g a.i ha^{-1} as PoE at 25 DAT	70.69	77.03	10.08	12.36	62.05	59.16
T_{12}	Pretilachlor @ 750 g a.i ha^{-1} as PE at 3 DAT followed by metsulfuron methyl + chlorimuron ethyl @ 4 g a.i ha^{-1} as PoE at 25 DAT	73.87	81.05	10.35	13.04	63.51	59.16
T_{13}	Hand weeding twice at 25 and 45 DAT	78.19	86.91	11.10	14.39	65.15	62.63
T_{14}	Weedy check	51.76	53.39	5.86	7.54	49.91	46.35
	SEm$\pm$	2.22	2.51	1.09	1.07	1.83	3.49
	CD (P=0.05)	6.48	7.33	3.19	3.16	5.34	7.22

Table 2: Nutrient uptake (N, P and K) by rice as influenced by weed management practices at harvest

S. No.	Treatments	N (kg ha^{-1})		P (kg ha^{-1})		K (kg ha^{-1})	
		2013	2014	2013	2014	2013	2014
T_1	Pretilachlor @ 625 g a.i ha^{-1} as PE at 3 DAT	98.21	95.16	15.98	18.62	95.16	91.73
T_2	Pyrazosulfuron ethyl @ 20 g a.i ha^{-1} 3 DAT	98.98	96.00	16.05	18.93	96.00	93.03
T_3	Pretilachlor 6% + bensulfuron methyl 0.6% @ 10 kg granules ha^{-1} as PE at 3 DAT	108.84	106.27	16.19	19.30	106.27	96.24
T_4	Pyrazosulfuron ethyl @ 20 g a.i ha^{-1} at 3 DAT followed by manual weeding at 25 DAT	127.87	130.98	20.51	23.06	130.98	102.30
T_5	Penoxsulam @ 22.5 g a.i ha^{-1} as early PoE at 12 DAT	100.98	98.17	16.35	19.01	98.17	94.14
T_6	Cyhalofop-p-butyl @ 100 g a.i ha^{-1} as early PoE 12 DAT	96.94	94.10	15.31	17.27	94.10	88.41
T_7	Bispyribac sodium @ 25 g a.i ha^{-1} as PoE 25 DAT	99.54	99.91	16.72	18.99	99.91	92.81
T_8	Azimsulfuron @ 35 g a.i ha^{-1} as PoE at 25 DAT	109.68	107.46	16.84	19.11	107.46	97.74
T_9	Bispyribac sodium @ 25 g a.i ha^{-1} + ethoxysulfuron 18.75 g a.i ha^{-1} as PoE at 25 DAT	110.38	108.62	18.81	20.59	108.62	101.41
T_{10}	Bispyribac sodium @ 20 g a.i ha^{-1} + metsulfuron methyl + chlorimuron ethyl @ 4 g a.i ha^{-1} as PoE at 25 DAT	122.76	125.71	19.28	20.81	125.71	101.65
T_{11}	Pretilachlor @ 750 g a.i ha^{-1} as PE at 3 DAT followed by ethoxysulfuron @ 18.75 g a.i ha^{-1} as PoE at 25 DAT	116.31	111.71	19.13	21.41	111.71	101.19
T_{12}	Pretilachlor @ 750 g a.i ha^{-1} as PE at 3 DAT followed by metsulfuron methyl + chlorimuron ethyl @ 4 g a.i ha^{-1} as PoE at 25 DAT	124.25	130.43	19.67	22.35	130.43	98.58
T_{13}	Hand weeding twice at 25 and 45 DAT	128.45	131.42	20.06	23.35	131.42	103.67
T_{14}	weedy check	92.12	93.75	14.65	16.34	93.75	86.94
	SEm$\pm$	3.12	2.14	0.76	1.03	2.14	2.58
	CD (P=0.05)	9.12	6.25	2.21	3.05	6.25	7.55

Greater uptake of nutrients supported growth contributing characters like plant height, tillers production, LAI and more dry weight production especially in treatments T_{13}, T_4, T_{12} and T_{10}. These results are in consonance with the finding of Deepa and Jayakumar (2008) [2] and Ramphool *et al. (*2007) [12].

4.5.2 Nutrient removal by weeds (N, P and K)

The data pertaining to effect of different weed management practices on nutrient removal (kg ha^{-1}) by weeds recorded at 60 DAT and at harvest were analysed statistically and presented in Table 3 and 4.

Significantly the lower N, P and K removed by weeds at 60 DAT and harvest was recorded with T_{13} (hand weeding twice at 25 and 45 DAT) and was statistically at par with T_4 (pyrazosulfuron ethyl @ 20 g a.i. ha^{-1} as PE at 3 DAT followed by manual weeding at 25 DAT), T_{12} (pretilachlor @ 750 g a.i. ha^{-1} as PE at 3 DAT followed by metsulfuron methyl + chlorimuron ethyl @ 4 g a.i. ha^{-1} as PoE at 25 DAT) and T_{10} (bispyribac sodium 20 g a.i.ha^{-1} + metsulfuron methyl + chlorimuron ethyl 4 g ha^{-1} as PoE at 25 DAT), T_{11} (pretilachlor @ 750 g a.i. ha-1 as PE at 3 DAT followed by ethoxysulfuron @ 18.75 g a.i. ha^{-1} as PoE at 25 DAT), T_8 (azimsulfuron @ 35 g a.i. ha^{-1} as PoE at 25 DAT), T_9 (bispyribac sodium 25 g ha^{-1} + ethoxysulfuron 18.75 g a.i.ha^{-1} as PoE at 25 DAT) and T_3 (pretilachlor 6% + bensulfuron methyl 0.6% @ 10 kg granules ha^{-1} as PE at 3 DAT). The higher nitrogen uptake by weed was recorded under T_{14} (weedy check) however which was on par with remaining other weed management practices T_5, T_2, T_7, T_1 and T_6 during both the years. These results are in tune with the findings of Ramphool *et al.* (2009) [13].

The pattern of nutrient removal by weeds showed that wherever effective weed control was possible the nutrient loss due to weeds was minimum. These results might be attributed to lesser weed dry weight production aiding in the reduced quantum of weed N, P and K removal. In the present study T_{13}, T_4, T_{12} and T_{10} where sequential application of herbicides or herbicide application supplemented with hand weeding proved superior. Vigorous crop growth smothered the weeds putting little growth and dry weight production. This was in accordance with findings of Ramphool *et al. (*2007) [12] and Deepa and Jayakumar (2008) [2] conversely, the maximum nutrient removal by weeds was observed in the plots where weeds were not controlled properly. Presumably, excessive weed growth prevented rice plant from absorbing nutrients (Jacob *and Syriac,* 2005) [6].

Nutrient Removal by Weeds

At Hyderabad Raghavendra *et al*. (2015) [11] reported significantly higher N, P and K uptake by weeds in unweeded check (21.79, 7.30 & 22.10 kg ha^{-1}) and was followed by metamifop @ 100 g a.i ha^{-1} at 3 leaf stage as PoE (11.41, 4.20 & 16.60 kg ha^{-1}) and pretilachlor + safener @ 0.4kg a.i ha^{-1} at 3 DAS as PE (9.71, 4.00 & 14.31 kg ha^{-1}) and weed free check registered the lower uptake of N, P and K by weeds (3.88,1.68 & 6.20 kg ha^{-1}) respectively and this was at par with bispyribac sodium @ 25 g a.i ha^{-1} at 25 DAS as POE (6.08,7.20 & 9.40 kg ha^{-1}), cyhalofop-butyl @ 100 g a.i ha^{-1} + chlorimuron ethyl + metsulfuron methyl @ 4 g a.i ha^{-1} at 15 DAS as POE (6.94, 3.03 & 10.30 kg ha^{-1}, respectively.

Significantly less removal of nitrogen, phosphorus and potassium of weeds (0.92 and 0.70 N kg ha^{-1}, 0.41 and 0.32 P kg ha^{-1} and 0.95 and 0.86 K kg ha^{-1}) was found with hand weeding twice at 20 and 40 DAT in transplanted rice and was followed by pre emergence application of bensulfuron methyl 60 g + pretilachlor 600 g a.i ha^{-1} followed by mechanical weeding at 30 DAT (1.24 and 0.96 kg N ha^{-1}, 0.69 and 0.45 kg P ha^{-1} and 1.39 and 1.20 K kg ha^{-1}) respectively during 2010 and 2011 in sandy loam soils of Hyderabad (Parameshwari and Srinivas, 2014) [10].

Maximum NPK uptake (kg ha^{-1}) of weeds was observed in weedy check at 40 DAT and at harvest whereas minimum NPK uptake of weeds was recorded in hand weeding at 20 and 40 DAT and was followed by sequential application of bensulfuron methyl 0.6% + pretilachlor 6% @ 10 kg ha^{-1} as PE and bispyribac sodium @ 25g a.i ha^{-1} at 20 DAT as PoE and bensulfuron methyl 0.6% + pretilachlor 6% @ 10 kg G ha^{-1} as PE followed by HW at 40 DAT in sandy clay soils of Hyderabad (Uma *et al*., 2014) [17].

In sandy loam soils of Orissa, Talla and Nanda (2014) [16] reported that the potassium content of weed was higher than nitrogen, phosphorus content was low compared with N and K content. Weedy check treatment removed higher N, P and K (82.45, 13.42 and 127.74 kg ha^{-1}). The lower nutrient uptake of N, P and K (kg ha^{-1}) of 17.34, 3.11and 29.44 was observed with cono weeding respectively. While in pyrazosulfuron-ethyl @ 20 g ha^{-1} nutrient uptake was 20, 3.5 and 33.4 kg ha^{-1} N, P and K respectively.

At Pantnagar the lower nutrient uptake (NPK) by weeds was noticed with two hand weedings (9.48 kg ha^{-1}, 1.35 kg ha^{-1} and 4.76 kg ha^{-1}), which was on par with penoxsulam @ 25 g ha^{-1} (11.96 kg ha^{-1}, 1.02 kg ha^{-1} and 5.36 kg ha^{-1}). It was followed by pyrazosulfuron ethyl 20 g ha^{-1} (16.62 kg ha^{-1}, 2.51 kg ha^{-1} and 7.88 kg ha^{-1}).The higher uptake of nutrients by weeds (43.23 kg N, 5.82 kg P and 20.15 kg K ha^{-1}) at 60 days was under unweeded treatment (Nath and Pandey, 2013).

Better control of weeds facilitated the low absorption of nutrients as evident from lower nitrogen uptake with application of azimsulfuron at 35.0 g a.i. ha^{-1} (2.7 kg ha^{-1}), azimsulfuron 22.5 g a.i.ha^{-1} (10.3 kg ha^{-1}) and weedy check recorded more nitrogen uptake (34.8 kg ha^{-1}) in alluvial clay loams of Cuttack (Saha and Rao, 2012) [14].

Intensity of competition for nitrogen increased with advance in age of the crop and weeds. Weeds divested the crop of 43.0 kg ha^{-1} at maturity stage. According to Deepa and Jayakumar (2008) [2] uptake of nitrogen by weeds increased and reduced the crop uptake as weed density increased and resulted in decreased yield**.**

At Puducherry in sandy clay loam soils, Dharumarajan *et al*. (2008) [4] observed less NPK removal by weeds in pretilachlor @ 1.5 kg ha^{-1} followed by hand weeding treatments (3.800 kg ha^{-1}, 0.303 kg ha^{-1}, 0.923 kg ha^{-1}) at panicle initiation stage and in unweeded control the higher N (3.800 kg ha^{-1}), P (1.087 kg ha^{-1}) and K (4.570 kg ha^{-1}) removal at panicle initiation stage and at harvest stage (5.55, 1.70, 8.78 kg ha^{-1}) respectively.

Balasubramanian and Palaniappan, (2001) [1] reported that weeds remove large amount of plant nutrients from the soil. An estimate shows that weeds can deprive the crops 47 per cent N, 42 per cent P, 50 per cent K, 39 per cent Ca and 24 per cent Mg of their nutrient uptake.

Echinochloa crusgalli may remove up to 80 % of nitrogen from the soil especially in the first half of growing season (Holm *et al*., 1991). The findings of Srinivasan *et al*. (2008) [15] indicated that the nutrient removal by weeds in transplanted rice was greatest during the summer and winter season. During summer the nutrient removal by weeds ranged 57.4-76.8, 83.5-121.2 and 8.0-10.6 kg of N, P_2O_5 and K_2O ha^{-1}, respectively.

Table 3: Nutrient removal (N, P and K) by weeds as influenced by weed management practices at 60 DAT of rice

S. No.	Treatments	N (kg ha^{-1})		P (kg ha^{-1})		K (kg ha^{-1})	
		2013	2014	2013	2014	2013	2014
T_1	Pretilachlor @ 625 g a.i ha^{-1} as PE at 3 DAT	9.23	10.20	1.67	1.26	8.40	8.36
T_2	Pyrazosulfuron ethyl @ 20 g a.i ha^{-1} 3 DAT	9.35	10.10	1.65	1.23	8.18	8.37
T_3	Pretilachlor 6% + bensulfuron methyl 0.6% @ 10 kg granules ha^{-1} as PE at 3 DAT	4.65	5.40	1.51	1.19	3.48	3.03
T_4	Pyrazosulfuron ethyl @ 20 g a.i ha^{-1} at 3 DAT followed by manual weeding at 25 DAT	4.25	5.01	0.62	0.63	3.08	3.11
T_5	Penoxsulam @ 22.5 g a.i ha^{-1} as early PoE at 12 DAT	8.29	9.87	1.53	1.22	8.13	7.92
T_6	Cyhalofop-p-butyl @ 100 g a.i ha^{-1} as early PoE 12 DAT	9.43	10.59	1.69	1.29	8.76	8.58
T_7	Bispyribac sodium @ 25 g a.i ha^{-1} as PoE 25 DAT	9.62	10.14	1.55	1.27	8.45	8.59
T_8	Azimsulfuron @ 35 g a.i ha^{-1} as PoE at 25 DAT	4.86	5.15	1.31	1.21	3.69	3.47
T_9	Bispyribac sodium @ 25 g a.i ha^{-1} + ethoxysulfuron 18.75 g a.i ha^{-1} as PoE at 25 DAT	4.83	5.02	0.93	0.70	3.66	4.25
T_{10}	Bispyribac sodium @ 20 g a.i ha^{-1} + metsulfuron methyl + chlorimuron ethyl @ 4 g a.i ha^{-1} as PoE at 25 DAT	4.77	5.31	0.92	0.67	3.60	3.37
T_{11}	Pretilachlor @ 750 g a.i ha^{-1} as PE at 3 DAT followed by ethoxysulfuron @ 18.75 g a.i ha^{-1} as PoE at 25 DAT	4.76	5.42	0.74	0.71	3.59	3.36
T_{12}	Pretilachlor @ 750 g a.i ha^{-1} as PE at 3 DAT followed by metsulfuron methyl + chlorimuron ethyl @ 4 g a.i ha^{-1} as PoE at 25 DAT	4.64	4.99	0.91	0.66	3.47	3.43
T_{13}	Hand weeding twice at 25 and 45 DAT	3.97	4.44	0.43	0.60	2.80	3.03
T_{14}	Weedy check	10.50	10.91	1.98	1.37	9.33	8.79
	SEm±	0.65	0.50	0.09	0.15	0.59	0.61
	CD (P=0.05)	1.91	1.48	0.26	0.45	1.72	1.78

Table 4: Nutrient removal (N, P and K) by weeds as influenced by weed management practices at harvest of rice

S. No.	Treatments	N (kg ha^{-1})		P (kg ha^{-1})		K (kg ha^{-1})	
		2013	2014	2013	2014	2013	2014
T_1	Pretilachlor @ 625 g a.i ha^{-1} as PE at 3 DAT	10.30	11.58	1.96	1.75	9.89	10.07
T_2	Pyrazosulfuron ethyl @ 20 g a.i ha^{-1} 3 DAT	10.10	11.46	1.94	1.76	9.89	10.01
T_3	Pretilachlor 6% + bensulfuron methyl 0.6% @ 10 kg granules ha^{-1} as PE at 3 DAT	6.13	6.89	1.57	1.54	5.61	6.15
T_4	Pyrazosulfuron ethyl @ 20 g a.i ha^{-1} at 3 DAT followed by manual weeding at 25 DAT	4.93	5.86	0.71	0.70	4.67	5.34
T_5	Penoxsulam @ 22.5 g a.i ha^{-1} as PoE at 12 DAT	10.20	11.33	1.58	1.54	10.08	9.96
T_6	Cyhalofop-p-butyl @ 100 g a.i ha^{-1} as PoE 12 DAT	10.71	11.92	1.72	1.90	10.65	10.27
T_7	Bispyribac sodium @ 25 g a.i ha^{-1} as PoE 25 DAT	10.71	11.74	1.68	1.54	9.69	10.02
T_8	Azimsulfuron @ 35 g a.i ha^{-1} as PoE at 25 DAT	6.87	6.54	1.40	1.62	5.69	6.24
T_9	Bispyribac sodium @ 25 g a.i ha^{-1} + ethoxysulfuron 18.75 g a.i ha^{-1} as PoE at 25 DAT	6.09	6.69	1.04	0.95	5.59	5.90
T_{10}	Bispyribac sodium @ 20 g a.i ha^{-1} + metsulfuron methyl + chlorimuron ethyl @ 4 g a.i ha^{-1} as post emergence at 25 DAT	6.01	6.61	1.04	1.02	4.89	5.90
T_{11}	Pretilachlor @ 750 g a.i ha^{-1} as PE at 3 DAT followed ethoxysulfuron @ 18.75 g a.i ha^{-1} as PoE at 25 DAT	5.32	6.48	1.06	1.01	5.08	5.79
T_{12}	Pretilachlor @ 750 g a.i ha^{-1} as PE at 3 DAT followed by metsulfuron methyl + chlorimuron ethyl @ 4 g a.i ha^{-1} as PoE at 25	5.81	6.43	0.98	0.94	4.58	5.74
T_{13}	Hand weeding twice at 25 and 45 DAT	4.93	5.54	0.51	0.76	4.25	5.30
T_{14}	Weedy check	11.36	11.98	2.01	1.90	11.00	10.57
	SEm±	0.83	1.90	0.16	0.10	0.92	0.63
	CD (P = 0.05)	2.42	5.56	0.45	0.30	2.71	1.85

Conclusion

Significantly the higher nitrogen, phosphorus and potassium uptake of crop was observed with T_{13} treatment (hand weeding twice at 25 and 45 DAT) and was comparable with T_4 (pyrazosulfuron ethyl @ 20 g a.i. ha^{-1} as PE at 3 DAT followed by manual weeding at 25 DAT), T_{12} (pretilachlor @ 750 g a.i. ha^{-1} as PE at 3 DAT followed by metsulfuron methyl + chlorimuron ethyl @ 4 g a.i. ha^{-1} as PoE at 25 DAT) and T_{10} treatment (bispyribac sodium @ 20 g a.i. ha^{-1} + metsulfuron methyl + chlorimuron ethyl @ 4 g a.i. ha^{-1} as post emergence at 25 DAT).

The higher NPK removal by weed was recorded under weedy check however which was on par with remaining other weed management practices *viz.*, single application of penoxsulam, pyrazosulfuron ethyl, bispyribac sodium, pretilachlor and cyhalofop p butyl at 60 DAT and harvest during both the years.

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References

1. Balasubrsmanian P, Palaniappan SP. Principles and Practices of Agronomy, Agrobios publishing Co. Pvt. Ltd., New Delhi, 2001, 306-364.
2. Deepa S, Jayakumar R. Studies on uptake of N, P and K as influenced by different rates (doses) of pretilachlor in transplanted rice. Madras Agricultural Journal. 2008; 95(7, 12):333-338.
3. Directorate of economics and statistics. Statistical year book. Government of Telangana. 2015, 92.
4. Dharumarajan S, Sankar R, Baskar A, Kumar K. Persistence of pretilachlor in coastal rice ecosystem. Pesticides research Journal. 2008; 20(2):273-274.
5. Holm LG, Plucknett DL, Pancho JV, Herberger JP. The world's worst Weeds: Distribution and Biology. The university Press of Hawali, Malabar, Florida, 1991.
6. Jackson HL. 1973. Soil Chemical Analysis. Prentice Hall of Inco. New York, USA. 498Jacob and Syriac, 2005.
7. Mani VS, Gautam KC, Chakraberty TK. Losses in crop yield in India due to Weed growth. Journal of Plant Protection in the Tropics. 1986; 2:142-158.
8. Ministry of Agriculture 201415, http: //www. agricoop.nic.in/.
9. Nath CP, Pandy PC. Evaluation of herbicides on grain yield and nutrient uptaken in rice (*Oryza sativa* L.). Bioinfolet. 2013; 101:282-287.
10. Parameswari YS, Srinivas A. Influence of Weed Management Practices on Nutrient Uptake and Productivity of Rice under Different Methods of Crop Establishment. Journal of Rice Research. 2014; 7(1, 2) 77-86.
11. Raghavendra BM, Susheela R, Rao PV, Madhavi M. Efficacy of different Weed management practices on growth and yield of direct wet seeded rice sown through drum seeder. The bioscan. 2015; 10(1):97-101.
12. Ramphool P, Pandey PC, Bisht PS, Singh DK. Nutrient uptake by crop and Weeds as influenced by trisulfuron, trisulfuron+pretilachlor and bensulfuron-methyl in transplanted rice (*Oryza sativa* L.). Indian Journal of Weed Science. 2007; 39(3, 4):239-240.
13. Ramphool P, Pandey PC, Bisht PS. Evaluation of new herbicides in transplanted rice (*Oryza sativa* L.). Pantnagar Journal of Research. 2009; 7(1):115-119.
14. Saha S, Rao KS. Efficacy of azimsulfuron against complex Weed flora in transplanted summer rice. *Oryza*. 2012; 49(3):183-188.
15. Srinivasan EK, Natarajan S, Ganapathy M, Arivazhagan K. Effect of nitrogen levels and Weed management in hybrid rice. *Oryza*, 2008; 45(2):160-162.
16. Talla A, Nanda SJ. Efficacy of different establishment methods and Weed management practices on Weed density, Weed dry matter, Weed control efficiency and yield under rainfed lowland rice. International Journal of Plant, Animal and Environmental Sciences. 2014; 4(3):189-191.
17. Uma G, Ramana VM, Reddy PK, Ramprakash T. Evaluation of low dose herbicides in transplanted rice (*Oryza Sativa* L.) International Journal of Applied Biology and Pharmaceutical Technology. 2014; 5(4):96-101.