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EFFECT OF PLANT POPULATION AND WEED CONTROL TREATMENTS ON WEED POPULLATION, NPK UPTAKE IN DIRECT WETSEEDED RICE(*Oryza sativa.L*) SOWN THROUGH DRUM SEEDER

B N Sandeep Nayak[1], Md Mujeeb Khan[2], K Mosha[3] and P Prasuna Rani[4]

Abstract— An investigation entitled "Effect of plant population and weed control treatments on weed population, NPK uptake in direct wet-seeded rice sown through drum seeder" was conducted at Wetland block of Agricultural college Farm , Bapatla, in *kharif* 2012. Six plant population treatments and five weed management treatments were tested in strip plot design. The maximum reduction of weed density and highest weed control efficiency was recorded in two cono weedings followed by two hand weedings at 20 and 40 DAS, pre-emergence application of pendimethalin @1 kg a.i. ha^{-1} post-emergence application of bispyribac sodium @ 20 g a.i ha^{-1} with a plant density of 71hills m^{-2}. Nutrient uptake by crop was significantly influenced on rice plant density from 20 hills m^{-2} (D_5) to 47 hills m^{-2} (D_2) significantly increased the nutrient (N, P, K) uptake. Among weed management practices, the data on nutrient ((N, P, K)) uptake indicated significantly the highest uptake of nitrogen (150.6 kg ha^{-1}) phosphorus (75.9 kg ha^{-1}) was observed in W_3 (cono weeding at 20 and 40 DAS) but highest potassium uptake (128.6 kg ha^{-1}) was in W_5 compared to all other treatments. But, plant density 47 hills m^{-2} was superior to other plant densities with respect to rice grain yield. The highest grain yield (4275 kg ha^{-1}) was achieved with plant density 47 hills m^{-2} (D_2) in combination of cono weedings twice (W_3) but remained at a par to hand weedings twice (4142 kg ha^{-1}).

Index Terms: bispyribac- sodium, Weed population, Drum seeding, cono weeding, pendimethalin, , Hand weeding

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1 INTRODUCTION

Rice (*Oryza sativa* L.) is the dominant staple food for many countries in Asia and Pacific, South and North America as well as Africa (Mobasser *et. al*. 2007) and also is a staple food for nearly half of the world's seven billion population. However, more than 90 per cent of rice is consumed in Asia, where it is a staple food for a majority of the population, including the 560 million hungry people in the region (Mohanty, 2013). The area under direct - seeded rice is increasing as farmers in India seek higher productivity and profitability to overcome increasing costs and scarcity of farm labour. One of the major reasons for non-remunerative rice production in recent times is augmented cost of cultivation because of scarce and costly farm labour during the peak period of farm operations. Establishing rice by transplanting is labour intensive and increasingly difficult due to higher cost and shortage of labour. Inadequate plant population with hired labour for transplanting is the major lacuna in this method (Ram *et al*. 2006). Drum seeding is an alternative method to transplanting. It reduces labour requirement and performs as good as transplanting method at many places (Yadav and Singh, 2006). However, drum seeding method is subjected to severe weed infestation than conventionally puddled transplanted rice that leads to because of the absence of the size disparity between the crop and weed plants and the suppressive effect of standing water on weed growth at crop establishment.

MATERIAL AND METHODS

A field experiment entitled "effect of plant population and weed control treatments on weed population, NPK uptake in direct wet-seeded rice sown through drum seeder)" was conducted at the Agricultural College Farm, Bapatla on sandy loam soil during *kharif* 2012. The treatments consisted of combination of five drum seeder spacings (20×7cm, 20×10.5cm, 20×14cm, 20×17.5cm, 20×24.5cm, and manual planting (20×15cm), with a rice plant population of 71, 47, 35, 28, 20 and 33 hills m^{-2}, respectively, and five weed management practices *viz.,* weedy check (W_1), hand weeding at 20 and 40 DAS (W_2), cono weeding twice at 20 and 40 DAS with modified cono weeder (W_3), pre-emergence application of anilofos @ 0.375 kg a.i ha^{-1} and post-emergence application of 2, 4 D salt @1.0 kg a.i ha^{-1} at 25 DAS (W_4), pre-emergence application of pendimethalin @1.0 kg a.i ha^{-1}post-emergence application of bispyribac sodium @ 20 g a.i ha^{-1} 30 DAS (W_5).

The trail was laid out in strip plot design and replicated thrice. The rice variety used was NLR - 33358 (*SOMASILA*). Fertilizer was applied at the rate of 120:60:60 N: P_2O_5:K_2O kg ha^{-1}. Nitrogen was applied in two split doses at time of tillering and panicle initiation stage along with basal dose. Phosphorus and potassium was applied as basal.

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Data collection on weed:

The uniform representative samples of weeds and crop were randomly collected from each plot, dried processed and analysed to determine N,P,K content which in turn were multiplied by respective dry matter to determine uptake. Weed population determination was done by quadrant method described by Mishra and Mishra (1997). Based on the weed drymatter recorded according to treatments weed control efficiency (WCE) was calculated using the following formula (AICR-PWC, 1988).

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

Where,

DWC = weed drymatter in unweeded control plot

DWT = weed drymatter in treated plot.

CHEMICAL ANALYSIS OF PLANT MATERIAL

Plant samples collected for chemical analysis were shade dried initially and then in an oven at 60^{0}C for about 24 hours and subsequently after cooling, ground in a hammer mill for estimating N, P and K content. Nitrogen was estimated by modified Microkjeldahl method, (Jackson, 1973), phosphorus by Vanado molybdo phosphoric acid method (Jackson, 1973) and potassium by flame photometric method (Jackson, 1973).

Nutrient uptake was calculated by using the formula given below:

$$\text{Nutrient uptake (kg ha}^{-1}) = \frac{\text{Nutrientconcentration (\%)} \times \text{Weight of dry matter (kg ha}^{-1})}{100}$$

Predominant weed flora of the experimental field:

Weed flora such as *Echinochloa colonum, Echinochloa crusgalli, Cynodon dactylon, Chloris barbata* (among the grasses); *Cyperus rotundus, Cyperus difformis, Fimbristylis miliacea* (among the sedges) and *Eclipta alba, Ludwigia parviflora, Ammania baccifera, Euphorbia hirta* among the (broad-leaved weeds) were found to be the predominant weeds in the experimental field.

Data collection of crop characters:

Data were collected from five hills per plot and then averaged.. Grains obtained from randomly selected five hills were sun dried and weighed carefully. Then it was averaged to get grain weight hill^{-1}. Straw obtained from randomly selected five sample hills of respective plot was dried in sun and weighed and then averaged. Grains obtained from each unit plot were sun dried and weighed carefully. The dry weights of grains from the panicle of the sample hills were added to the respective plot yield to record the grain yield plot^{-1}. Straw obtained from each unit plot including the straw of five sample hills of respective plot was dried in sun and weighed to record the straw yield plot^{-1}. The grain and straw yields per plot were subsequently converted to ha^{-1}and recorded. Data recorded for different crop parameters were compiled and tabulated in proper form for statistical analysis. The experimental data are statistically analyses by using Fisher's method of analysis of variance as outlined by Panse and Sukhatme (1978). Critical Difference (CD) was calculated wherever F-test was found significant. The level of significance used in F-test was five per cent.

RESULTS AND DISCUSSION

Weed population (no. m^{-2}):

Effect of planting population:

The data pertaining to weed population recorded at different intervals are presented in Table:1 and depicted in Fig.4.1 . An increase in plant population decreased the weed population in direct seeded rice from 47 to 71 plants m^{-2} which was also significantly lower than that recorded in traditional rice transplant system. An interesting fact to note is that a plant population of 35 hills m^{-2} either in direct seeded or transplant condition shown similar level of weed population clearly depicted that rice plant population surely had effect of suppression the weed growth by limiting the passage of sunlight, rain and changing climate. Similar trend was noticed at all other stages of crop growth *i.e.,* 40, 60 and at harvest. However the effective of weed growth suppression was seen up to 40 DAS, thereafter a marginal increase in weed population was noticed indicating that even rice canopy could not prevent new weed seed germination and during those stages higher rice plant population of 71 hills m^{-2} was effective in controlling new weed seed germination.

Effect of weed control treatments:

Among different weed management practices averaged over rice plant population treatments, at 20 days after sowing, significantly lower (59.9 m^{-2}) weed population was recorded with pre-emergence application of pendimethalin followed by post-emergence application of bispyribac-sodium (W_5) (or) pre-emergence application of anilofos followed by post-emergence application of 2, 4.D sodium salt (W_4). These two treatments significantly reduced the weed population as compared to W_1, W_2, and W_3 treatments. W_4 and W_5 treatments were at a par in reducing weed population . This effect was seen only up to 20 DAS. During the advanced stages of crop growth hand weeding twice (W_2), weeding twice with cono weeder (W_3) showed excellent effect on reducing weed population and all these treatments significantly reduced the weed population in comparison to weedy check. Among all weed control treatments the efficacy of W_4 treatment reduced to some extent during the advanced stages of crop growth as grassy weeds dominated the broad leaved weeds particularly during 60 DAS and at maturity stages of crop. These observations at 20 DAS might be due to the fact that pre-emergence application of pendimethalin in W_5 and anilofos inW_4 effectively prohibited the emergence of wide spectrum flora, as compared to rest of the treatments (W_1, W_2 and W_3). These results are in correlation with the findings of Bhowmick *et al.* (2000), Moorthy and Saha (2002) and Walia *et al.* (2008a).

Interaction effect on planting population and weed control treatments:

The interaction between rice plant densities and weed management treatments was significant in reducing weed population during all the stages of crop growth, at 20 DAS a treatment combination of higher rice plant population 71 plants m^{-2} or 47 plants m^{-2} with pre-emergence application of pendimethalin or anilofos post-emergence application of bispyribac sodium or 2, 4 D sodium salt ($D_1 \times W_5$), ($D_2 \times W_5$), ($D_1 \times W_4$), showed significant reduction in weed population over weedy check treatments. The effects of these transplanted rice treatments was though found better than that seen in transplanted

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rice treatment but were at a par with this treatment. These results clearly show that high rice population with pre and post emergence herbicide combination under direct seeded condition is the better option even over traditional compulsive transplanted system to control the weeds in this eco system of rice cultivation.

Weed Control Efficiency (%):

Effect of planting population:

At 20 DAS, there is no significant difference with respect to weed control efficiency among various rice plant population treatments. Among various weed management practices, weed control efficiency at this stage of crop growth was highest (46%) with W_5 which significantly superior over all other weed management practices. A significant interaction between rice plant population and weed management practices showed that at all rice plant densities W_5 showed superiority in enhancing the weed control efficiency as a result of effective weed control right from emerging stage of rice crop. These results are akin to the findings of Moorthy and Saha, (2002).

Effect of weed control treatments:

At later stages of crop growth *i.e.* from 40 DAS to till harvest any weed management practices coupled with higher rice plant population played a pivotal role in improving the weed control efficiency as seen from very a significant interaction among various treatments combination. These results evaluated that higher plant population played favourable role in reducing the weed number and growth of varying weed fauna, added to that application of manual, mechanical or herbicidal treatments further improved, the suppressive effect on weeds there by increasing the weed control efficiency. These results are well supported by the of Walia *et al.* (2008b) and Yadav *et al.* (2009).

NUTRIENT UPTAKE BY CROP

Nitrogen uptake:

Effect of planting population:

Increase in rice plant population from 20 hills m^{-2} (D_5) to 47 hills m^{-2} (D_2) significantly increased the nitrogen uptake. The highest nitrogen uptake of 136.5 kg ha^{-1} was observed with 47 hills m^{-2} (D_2) and it was significantly superior to that at D_1, D_3, D_4,and D_5), respectively, but it was recorded on par with manual transplant (D_6). These results are in conformity with those reported by Balasubramaniyan *et al.* (1993).

Effect of weed control treatments:

Among weed management practices, the data on nitrogen uptake indicated the significantly highest uptake of nitrogen (150.6 kg ha^{-1}) was observed in W_3 (cono weeding at 20 and 40 DAS) compared to all other treatments. The weedy check treatment (W_1) recorded lowest uptake of nitrogen (85.8 kg ha^{-1}).

Interaction effect on planting population and weed control treatments

A significant interaction between rice plant densities and weed management practices, treatment showed that significantly higher N uptake was in $D_2 \times W_3$ and $D_6 \times W_3$ combination elucidating the fact 33 to 47 hills m^{-2} and churning of soil helped in enhancing N uptake by facilitating better growth in these treatment combinations.

Phosphorus uptake:

Effect of planting population:

Similar to N uptake significant improvement in phosphorus uptake was noticed with an increase in plant densities from 20 (D_5) to 47 hills m^{-2} (D_2). The maximum uptake of phosphorus 69.9 kg ha^{-1} was at 47 hills m^{-2} (D_2), which was significantly superior to other plant densities.

Effect of weed control treatments:

The data on phosphorus uptake indicated that among weed management practices, the highest uptake of phosphorus (75.9 kg ha^{-1}) was observed in W_3 (cono weeding at 20 and 40 DAS), while lowest uptake (45.3 kg ha^{-1}) was recorded in weedy check treatment.

Interaction effect on planting population and weed control treatments

A significant interaction between rice plant densities and weed management practices showed that significantly highest uptake of P (85 kg ha^{-1}) was observed in $D_2 \times W_3$ followed by $D_1 \times W_2$ (81.2 kg ha^{-1}) and $D_6 \times W_2$ (81 kg ha^{-1}). The highest P uptake in these treatments might have paved the way for luxuriant weed growth which in turn weed synchronize effect on N and K uptake there by ultimately enhancing rice yield attributes and grain yield in those treatments.

Potassium uptake

Effect of planting population:

Similar to N and P the uptake of potassium increased significantly with increased plant densities. The highest potassium uptake of 126.6 kg ha^{-1} was observed with 47hills m^{-2} (D_2) and it was significantly superior to that of all other plant densities.

Effect of weed control treatments:

The data on potassium uptake indicated that among various weed management practices, the highest uptake (142.2 kg ha^{-1}) of potassium was observed in W_5 (pre-emergence application of pendimethalin followed by post-emergence application of bispyribac sodium) while it was recorded lowest (76.5 kg ha^{-1}) in weedy check treatment.

Interaction effect on planting population and weed control treatments

A significant interaction showed that K uptake was on a par in $D_2 \times W_5$, $D_1 \times W_5$, $D_2 \times W_3$, $D_3 \times W_3$ and $D_6 \times W_3$, respectively which was significantly higher to that observed in most of the other treatment combinations.

Grain yield (kg ha^{-1})

Effect of planting population :

Among various rice plant densities, a medium level population of 47 hills $^{-2}$ (D_2) significantly increased the paddy over all other treatments except D_1 treatments with a plant population of 71 hills m^{-2} The highest grain yield of 3476 kg ha^{-1} was observed with a plant population of 47 hills m^{-2} and it was significantly superior to 35, 28, 20 drum seeded and 33 hills m^{-2} transplanting paddies. It was on a par with a grain yield of 3154 kg ha^{-1} in D_1. The manual transplant (D_6) gave yield of 3085 kg ha^{-1}which was on par with the plant population 71 and 35 hills m^{-2} drum seeded rice (D_3) with 3154 and 3060 kg ha^{-1} respectively.

Effect of weed control treatments:

Among the weed management practices, significantly higher paddy grain yield (3747 kg ha^{-1}) as compared to all other weed management practices was recorded by twice cono weeding (W_3) which was on a par with twice manual weeding W_2 treatment with 3570 kg ha^{-1}. The significant lowest plant grain

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yield (1188 kg ha^{-1}) was recorded by the weedy check (W_1) treatment. Among chemical methods of weed management pre-emergence application of pendimethalin followed by post-emergence application of bispyribac sodium at 30 DAS (W_5) was found better in increasing the yield over the pre-emergence application of anilofos followed by post-emergence application of 2,4.D sodium salt (W_4). The increase in paddy grain yield cono weeding (W_2), hand weeding twice (W_3), application of and pendimethalin followed by bispyribac-sodium (W_5) and application of anilofos followed by 2,4 D sodium salt (W_4) over weedy check (W_1) was 67.4, 66.4, 63 and 56 per cent, respectively. Sequential application of pre-emergence followed by post-emergence herbicide proved better for prolonged period of controlling weeds to realise higher yields in rice. These results are in conformity with the finding of Bhowmick *et al*. (2000)

Interaction effect on planting population and weed control treatments

A significant interaction between rice plant densities and weed management practices showed that a treatment combination of $D_2 \times W_3$ gave the highest paddy grain yield of 4275 kg ha^{-1} which was significantly superior to all the treatment combination. Next best treatment combination is $D_2 \times W_2$ and $D_1 \times W_3$ with a grain yield of 4142 kg ha^{-1} and 4124 kg ha^{-1} and superior to all other treatment combination even when compared with transplanted paddy system. These results clearly showed that medium to slightly higher plant densities above 33 hills m^{-2} with a combination of weed management technique which will serve the dual purpose of controlling first and second generation of both grassy and broad leaved weeds with an added advantage of soil pulverisation to enhance intermittent aeration would be the better option to extract higher rice productivity through direct seeded method of drum seeding which was even better than the traditional system of transplanted paddies particularly under the situation of depleting manual labour scenario.

REFERENCES:

AICRPWC. 1988. All India Coordinated Research Project on Weed Control. Project Coordinator's Report, Central Rice Research Institute, Cuttack.*Bangladesh J. Train. Dev*. 3(2): 31-34.

Bari, M.N., A.A. Mamun and S.M.S. Anwar. 1995. Weed infestation in transplant aman rice as affectedby land topography and time of transplanting. Bangladesh. J. Agric. Sci. 22: 227-235.

Bhowmick, M. K., Ghosh, R. K and Pal, D. 2000. Bio-efficacy of new promising herbicides weed management in summer rice. *Indian Journal of Weed Science.* 32 (1&2): 35-38.

Bond, J. A., Walker, T. W., Bollich, P. K., Koger, C. H and Gerard, P. 2005. Seeding rates for stale seedbed rice production in the midsouthern United States. *AgronomyJournal*. 97:1560–1563.

Jackson, K. L. 1973 Soil Chemical analysis, Prentice hall Indian Private Limited, New Delhi pp: 179.

Mahajan, G., Gill, M. S. and Singh, K. 2010. Optimizing seed rate to suppress weeds and to increase yield in aerobic direct-seeded rice in Northwestern Indo-Gangetic plains. *Journal of New Seeds*. 11:225-238.

Miah, M.H.N., M.A. Karim, M.S. Rahman and M.S. Islam. 1990. Performance of nitrogen nutrients under different row spacing.

Mishra, M and Mishra, A.1997. Inistitution of integrated pest management index in a Jute a new approach. *Indian Journal of Weed Science* 29:39-42

Mobasser, H.R., M.M. Delarestaghi, A. Khorgami, B.D. Tari and H. Pourkalhor. 2007. Effect of planting population on agronomical characteristics of rice (*Oryza sativa* L.) varieties in North of Iran. *Pakistan J. Biological Sci.* 10(18): 3205-3209.

Mohanty, S. 2013. Trends in global rice consumption. *Rice Today* : 44-45.

Moorthy B. T.S and Saha, S. 2002a. Evaluation of pre and post-emergence herbicides for their effects on weeds and upland direct seeded rice. Indian Journal of Weed Science 34 (3 & 4): 197-200.

Panse, V. G and Sukhatme, P. V. 1978. Statistical methods for agricultural workers ICAR, New Delhi. pp: 145-150

Ram, M., Hari O.M., Dhiman, S.D. and Nandal, D.P. 2006. Productivity and economics of rice (*Oryza sativa)*-Wheat (*Triticum aestivam)* cropping system as affected by establishment methods and tillage practices. *Indian Journal of Agronomy.* 51(2):77-80.

Uphoff, N. 2001. Scientific issue raised by the system of rice intensification: A less – water rice cultivation system. In: Proceedings of an International Workshop on Water Saving Rice Production Systems at Nanjing University, China, 2-4 April 2001. *Plant Research Institute.* Wageningen University. pp. 82-99.

Walia, U. S., Singh, O., Nayyar, S and Sindhu, V. 2008b. Performance of post-emergence application of Bispyribac in dry-seeded rice. *Indian Journal of Weed Science.* 40(3&4): 157 – 160.

Yadav, D. B., Yadav, A and Punia, S.S. 2009. Evaluation of Bispyribac- sodium for weed control in transplanted rice. *Indian Journal of Weed Science.* 41 (1-2): 23-27.

Yoshida, S. 1981. Fundamentals of rice crop science, IRRI Los Banos, Philippines pp: 132-146.

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B N Sandeep Nayak[1], Md Mujeeb Khan[2], K Mosha[3] and P Prasuna Rani[4]

Department of Agronomy, Agricultural College, Bapatla 522101, Andhra Pradesh. ANGRAU

1. P.G. Student, Department of Agronomy, Agricultural College, Bapatla. ANGRAU

2. Principal Scientist & Head (Retired) I W M Unit. RARS, Lam Farm, Guntur. ANGRAU

3. Coordinator, DAATTC. Visakhapatnam, A.P. ANGRAU

4. Associate Professor, Department of soil science and agriculture chemistry, Agricultural College, Bapatla, ANGRAU.

Table no.1: ***Effect of plant population and weed control treatments on weed population, NPK up-take in direct wet seeded rice sown through drum seeder***

TREATMENT		Weed density (m^{-2})	Weed con-trol efficien-cy (%)	Number of productive tillers m^{-2}	NUTRIENT UPTAKE (Kg ha^{-1})			Grain yield (kg ha^{-1})
					N	P	K	
PLANT DENSITY (D)								
D_1	**20 ×7cm (71 hills m^{-2})**	45.9	45.2	233	129.2	66.6	121.6	3154
D_2	**20 ×10.5cm (47 hills m^{-2})**	50.9	42.0	279	136.5	69.9	126.6	3476
D_3	**20 ×14cm (35 hills m^{-2})**	52.5	31.8	171	124.0	63.3	120.1	3060
D_4	**20 ×17.5cm (28hills m^{-2})**	58.3	15.3	149	120.0	58.2	115.3	2598
D_5	**20 ×24.5cm (20 hills m^{-2})**	60.9	32.9	92	117.5	55.6	108.8	2419
D_6	**Manual transplanting 20 ×15cm (33 hills m^{-2})**	51.3	35.5	196	134.1	64.2	123.2	3085
	SEm±	1.0	1.9	5	1.2	0.4	0.03	104
	CD (p = 0.05)	3.3	NS	16	3.8	1.2	0.1	328
	CV (%)	7.6	10.4	6.7	3.7	8.5	8.4	14
WEED MANAGEMENT (W)								
W_1	**Weedy check**	124.9	0	119	85.8	45.3	76.5	1188
W_2	**Hand weeding at 20 and 40 DAS**	33.3	42.7	235	139.1	74.2	132.4	3570
W_3	**Cono weeding at 20 and 40 DAS**	38.4	45.9	244	150.6	75.9	128.6	3747
W_4	**Anilofos @ 0.375 Kg a.i ha^{-1} (3-5 DAS) followed by 2, 4 D Salt 1.0 Kg a.i ha^{-1} at 20-25 DAS**	42.5	34.5	174	119.6	56.3	116.4	3004
W_5	**Pendimethalin @1.0 Kg a.i ha^{-1} (3-5 DAS) followed by Bispyribac Sodium @ 20 g a.i ha^{-1} 30 DAS**	32.3	46.4	212	139.3	68.1	142.2	3235
	SEm±	2.9	1.2	4	1.24	0.25	0.04	160
	CD (p = 0.05)	9.8	4.1	12	4.0	0.8	1.1	520
	CV(%)	23.0	14.7	5.7	4.1	5.3	10.4	23

		Weed density		Weed control efficiency		Productive tillers		N		P		K		Grain yield	
	Interaction	W x C	C x W	W x C	C x W	W x C	C x W	W x C	C x W	W x C	C x W	W x C	C x W	W x C	C x W
	SEm±	3.7	2.9	06	3.2	78	09	8.3	2.4	4.3	0.8	4.4	0.12	18	14
	CD (p = 0.05)	10.8	9.0	18.0	12.6	230	27	17.1	7.3	12.7	0.3	12.5	2.4	53	43
	CV (%)	7.0.		7.3		5.8		3.4		13.7		7.9		5.5	

Note:

D×W=densities means at the same level of weed management means

W×D= weed management means at the same level of densities means

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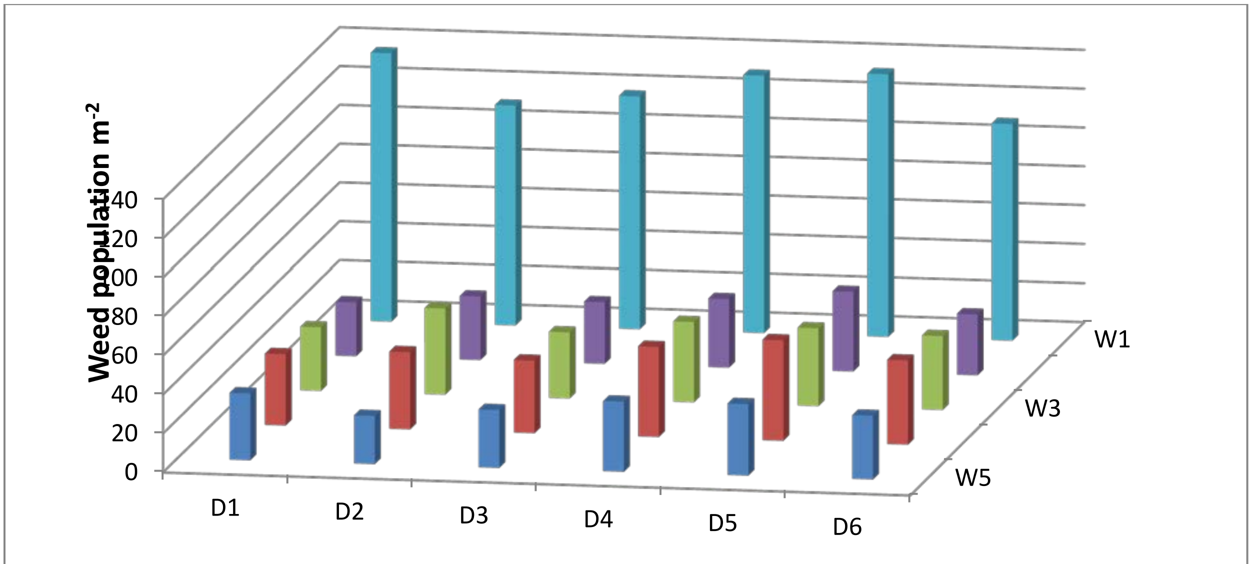
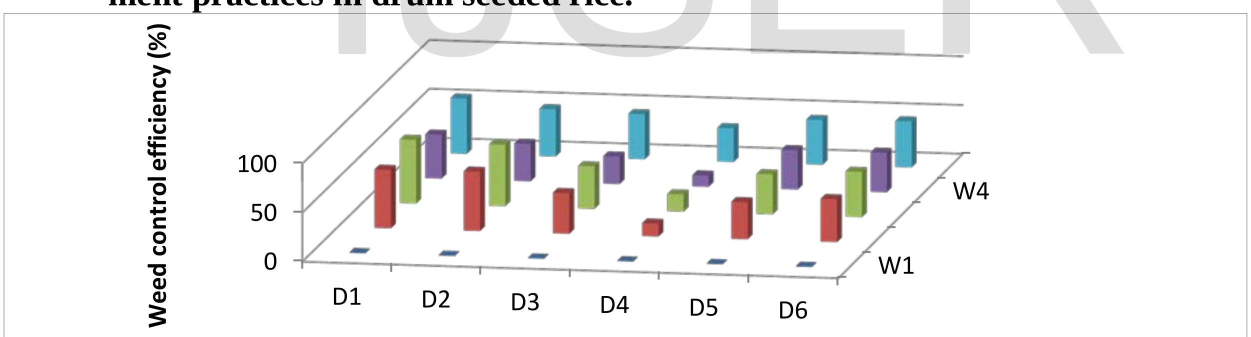


	D1	D2	D3	D4	D5	D6
W5	34.3	24.7	29.7	36	36.7	32.7
W4	36.7	39.7	37.3	46.3	51.7	43.3
W3	32.7	44.3	34	41.3	40	38
W2	27.7	32.7	31.7	35.3	41	31.3
W1	138	113	119.7	132.3	135	111.3

RICE PLANT DENSITIES(D) WEED MANAGEMENT PRACTICES(W)

Fig. 1.Weed population at harvest as influenced by varied rice plant densities and weed management practices in drum seeded rice.



	D1	D2	D3	D4	D5	D6
W1	0	0	0	0	0	0
W2	59.7	60.6	41.5	13.1	37.8	43.7
W3	65	62.8	43.4	17.5	40.9	46.2
W4	44.9	38.3	28.1	11.5	40.2	40.4
W5	56.5	48.4	46.1	34.5	45.7	47.1

RICE PLANT DENSITIES(D) WEED MANAGEMENT PRACTICES(W)

Fig.2 Weed control efficiency at harvest as influenced by varied rice plant densities and weed management practices in drum seeded rice

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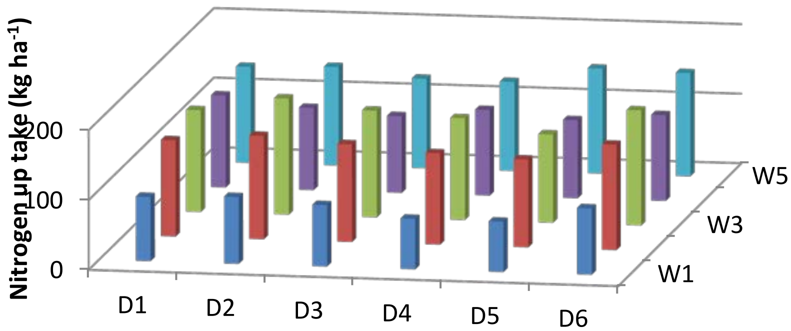
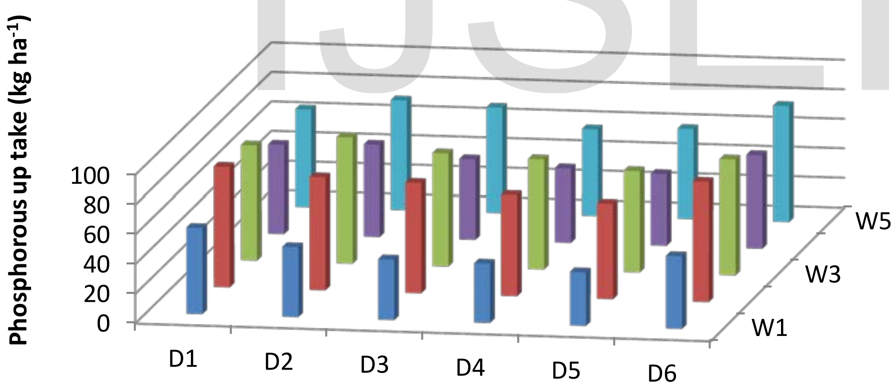


	D1	D2	D3	D4	D5	D6
W1	92	95.7	88	72.3	72	95
W2	138	148.3	140.1	131	126	151.1
W3	146	166.7	153.1	146	126.7	165.1
W4	132	118	110.1	122.7	112	123.1
W5	138	141.7	128.7	128	151	148.4

RICE PLANT DENSITIES(D)

WEED MANAGEMENT PRACTICES(W)

Fig.4.Nitrogen up take by rice as influenced by varied rice plant densities and weed management practices in drum seeded rice



	D1	D2	D3	D4	D5	D6
W1	58.2	47.2	40.9	40.1	36.2	49.1
W2	81.2	76.1	74.3	68.2	64.5	81
W3	77.6	85	76.2	74.2	68.2	78.1
W4	60.1	62.1	54.2	50.1	48.2	63
W5	66	74.1	71.2	58.5	60.7	78.3

RICE PLANT DENSITIES

WEED MANAGEMENT PRACTICES(W)

Fig.5.Phosphorous up take by rice as influenced by varied rice plant densities and weed management practices in drum seeded rice.

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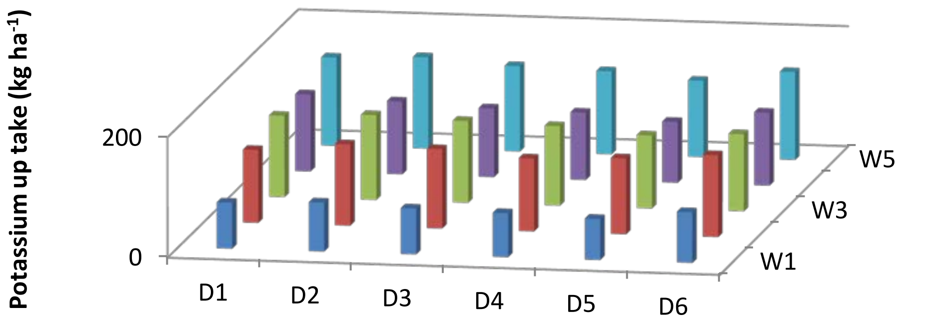
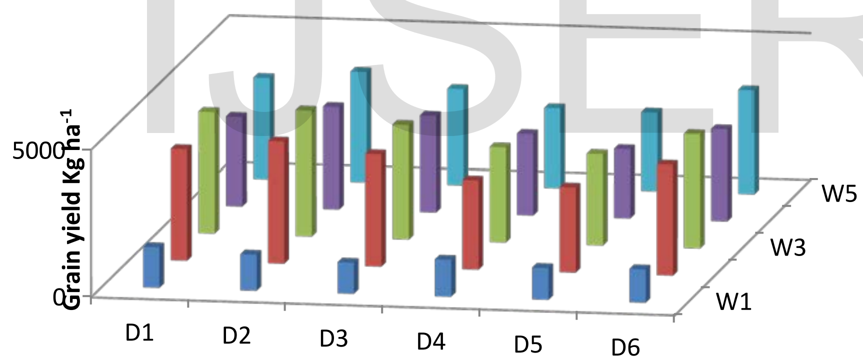


	D1	D2	D3	D4	D5	D6
W1	76.3	81.2	76	73.1	68.2	84
W2	121.2	135.2	132	121.1	126.1	136.1
W3	135.3	141.1	136.1	132.2	121.3	128.2
W4	128.3	121.1	114.3	112	101.3	121.4
W5	147.1	152.3	142.2	138.2	127.1	146.3

RICE PLANT DENSITIES(D) WEED MANAGEMENT PRACTICES(W)

Fig.6.Potassium up take as influenced by varied rice plant densities and weed management practices in drum seeded rice.



	D1	D2	D3	D4	D5	D6
W1	1378	1230	1054	1256	1078	1133
W2	3779	4142	3811	3034	2897	3759
W3	4124	4275	3887	3224	3098	3875
W4	3038	3478	3277	2759	2345	3124
W5	3451	3755	3273	2719	2675	3534

RICE PLANT DENSITIES (D) WEED MANAGEMENT PRACTICES (W)

Fig.7. Grain yield as influenced by varied rice plant densities and weed management practices in drum seeded rice