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To determine the impact of weed control technique on rice (*Oryza sativa* L.) growth, yield and economics

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Abstract
An experiment entitled "To determine the impact of weed control technique on rice (*Oryza sativa* L.) growth, yield and economics" a field experiment was conducted at Agronomy Research Farm of Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (Uttar Pradesh) during *Kharif* 2020. The experiment was laid out in Randomized Block design with four replications. The treatment consisted of weed management practices (T_1- Pretilachlor @ 1.25 kg ha^{-1} (PE), T_2- Bispyribac sodium @ 25g a.i. ha^{-1} (POE), T_3- Pretilachlor @ 1.25 kg ha^{-1} (PE) + Bispyribac Sodium @ 25 g a.i. ha^{-1} (POE), T_4:- Hand weeding (20 and 40 DAT), T_5- Weed Free (Till mature), T_6- Weedy Check) was used. The results revealed that all the growth parameters and yield attributes were significantly influenced due to different treatments. The scrutiny of data of yield attributes clearly reveals that the application of weed free till mature gave significantly the highest value of growth , yield attributes and yields followed by hand weeding (T4). Among herbicides the Pretilachlor @ 1.25 Kg ha^{-1}(PE) + Bispyribac sodium @ 25g a.i. ha^{-1} (POE) (T3) having more growth ,yield attributes and yield with other rest herbicides. The highest cost of cultivation of Rs.114146.00 per ha was incurred under treatment (T_5) Weed free till mature due to higher labour cost followed by 2 hand weeding (T_4) Rs.87833.00. The highest gross return (130420.4 Rs. ha^{-1}) was obtained with treatment (T_5) weed free till mature. The highest net return (85577.0 Rs. ha^{-1}) was obtained with treatment (T_3) Pretilachlor @ 1.25 Kg ha^{-1}(PE) + Bispyribac sodium @ 25g a.i. ha^{-1} (POE). The highest benefit cost ratio (2.21) was obtained with treatment (T_3) Pretilachlor @ 1.25 Kg ha^{-1}(PE) + Bispyribac sodium @ 25g a.i. ha^{-1} (POE).

Keywords: weed management, rice, growth parameter and yield

Introduction
Rice (*Oryza sativa* L.) is belong to the family Poaceae and its chromosome no is 2n= 24. The origin place of rice is Indo-Burma region. It is the primary source of nutrition for more than 60% of the world's population. Paddy is grown on an estimated 162.06 million hectares worldwide, with production and productivity of 505.00 million metric tonnes and 6.71 tonnes per hactare, respectively, throughout the growing season (Acc. to USDA, 2019). Paddy was grown over an area of roughly 44.00 million hectares in India, with production and productivity of 117.94 million tonnes and 26.63 q ha-1, respectively, during the year (Anonymous, 2019). In U.P., it is grown on 5.95 million hac. area with production of 15.00 million tonne and productivity of 23.30 q ha^{-1} (Anonymous, 2019). Weeds compete with paddy, resulting in yield losses of 50-65 percent for wet seeded paddy and up to 76 percent for transplanted rice. Weeding can be delayed during the height of the labour crisis and in the face of bad weather conditions. However, delaying weeding for more than 15-25 days reduces production by 43 kg per hactare per day between 25 and 45 days. Pre-emergence herbicides have been found to be effective in the early stages, however the second glow of weeds has been a concern at later stages. In such cases, herbicides should be applied in a sequential or mixed manner. such as pretilachlor or pretilachlor + bispyribac sodium is the only alternative. Sequential application of weedicides with varying selectivity is possible, but it raises the expense. As a result, combining two different herbicides and applying them simultaneously saves time and money while providing a broad range of weed control. Hand weeding showed the lowest weed dry weight of 4.0 and 3.0 kg ha^{-1}. In rice, hand weeding twice (20 and 40 days after planting) resulted in lower weed dry weight and increased mean grain and straw yield. (Jayadeva *et al.,* 2009) [1]. The manual weeding was at par with bispyribac sodium at 20 g ha^{-1} to 30 g ha^{-1}. The bispyribac sodium at 15 g ha^{-1} reduced the weeds but not to the level of hand weeding or bispyribac sodium at 20 g ha^{-1}. (Christos *et. al.,* 2008) [2] revealed that bispyribac

sodium @ 24 to 36 g ha^{-1} at 3 to 4 leaves stage of weeds controlled weeds to an extent of 89 to 100%.

Materials and Method

The experiment was conducted at Agronomy research form Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) during *Karif* season of 2020-21. The soil of the experimental field was silt loam in texture with medium soil fertility.

The experiment was laid out in Randomized Block design with four replications. The treatment consisted of weed management practices (T_1- Pretilachlor @ 1.25 kg ha^{-1} (PE), T_2- Bispyribac sodium @ 25g a.i. ha^{-1} (POE), T_3- Pretilachlor @ 1.25 kg ha^{-1} (PE) + Bispyribac Sodium @ 25 g a.i. ha^{-1} (POE), T_4:- Hand weeding (20 and 40 DAT), T_5- Weed Free (Till mature), T_6- Weedy Check) was used.

The required quantity of fertilizer and manures was applied treatments wise before transplanting in experimental field. Experimental crop was fertilized @120 N + 60P_2O_5 + 40 K_2O kg ha^{-1}. Half dose of nitrogen and full dose of phosphorus and potash was appalled through urea DAP and MOP. The rest half dose of nitrogen top dressed in two splits at tillering and panicle initiation stage. Farm yard manure as per treatment was applied and mixed 20 days before transplanting of crop.

Twenty-four days old seedling of rice was transplanted at 20x10 cm hill spacing by using 2-3 seedlings per hill.

Result and Discussion

For this experiment the data were statistically analyzed and presented with the help of table. Following result should be obtained in this experiment.

Growth attributes

The data pertain to plant height are summarized in Table 1. There was progressive increase in plant height with increase in age of crop up to 120 DAT and then slowed down at harvest. Thereafter indicating that grand growth period lies between 30-90 DAT. Scanning of Table 1 clearly found that there was significant increase in plant height of rice due to weed management treatments except 30 DAS.

The weed management practices found weed free till mature (T_5) found significant till maturity over weedy check and at par with all rest treatments at 60 DAT & 90 DAT. At 120 DAT and At harvest weed free (till mature) (T_5) found significant more plant height over Pretilachlor @ 1.25 Kg ha^{-1}(PE) (T_1), Bispyribac sodium @ 25g a.i. ha^{-1} (POE) (T_2) and weedy check (T_6) and at par with other rest treatments.

Growth is irreversible process occurs by the cell division and cell elongation which leads to plant biomass, weight and size of leaves and stems. Almost all the growth parameters followed sigmoid curve. Plant height followed sigmoid curve as the initially the rate of growth (plant height) was rapid followed by rather slow till 90 DAT stage. It showed that the higher increasing rate of plant height was observed between 30 to 90 DAT and nominal increasing at harvest stages of rice.

Plant height is mainly controlled by the genetic make-up of genotype, but it is also affected by nutrition and environmental conditions. In the present study, the various weed management practices had no significant effect on during initial stages. It was observed that the Among weed management practices, the maximum growth characters was observed in weed free till mature (T_5) treatment and minimum with weedy check (T_6). The lower values of growth attributes under weedy check (T_6) was mainly due to higher weed growth and higher crop-weed competition. Increase in plant height under different weed management practices as compare to weedy check (T_6) might be due to lowest weed population and dry weight due to lesser crop weed competition which provided better opportunity for better utilization of nutrient, moisture, space and solar radiation to the crop. This was ultimately resulted in improved growth of crop. These results are supported by the findings of Singh *et al.* (2007) [3] and Nath and Panday (2013) [4].

Table 1: Plant height (cm) as influence by weed management at different growth stages of rice

Treatments	Plant height (cm)				
	30 DAT	60 DAT	90 DAT	120 DAT	At harvest
T_1:- Pretilachlor @ 1.25 Kg/ ha	33.31	79.21	91.15	93.00	92.80
T_2:- Bispyribac sodium @25 a.i./ ha	32.91	79.90	92.01	92.20	94.01
T_3:- Pretilachlor @ 1.25 Kg/ ha + Bispyribac sodium @ 25g a.i./ ha	33.51	82.82	95.20	97.41	97.20
T_4:- Hand weeding (20 and 40 DAT)	34.40	83.50	96.10	98.20	98.00
T_5:- Weed free (Till mature)	34.00	85.40	98.60	104.50	104.30
T_6:- Weedy check	33.80	71.20	81.90	83.70	83.50
SEm±	1.15	2.61	3.20	3.32	3.33
CD at 5%	NS	7.86	9.66	10.01	10.03

Table 2: Number of tillers (m^{-2}) as influence by weed management at different growth stages of rice

Treatments	Number of tillers (m^{-2})				
	30 DAT	60 DAT	90 DAT	120 DAT	At harvest
T_1:- Pretilachlor @ 1.25 Kg / ha	109.41	296.02	305.20	302.20	299.21
T_2:- Bispyribac sodium @ a.i./ ha	110.42	303.60	313.03	309.95	306.91
T_3:- Pretilachlor @ 1.25 Kg /ha+ Bispyribac sodium @ 25g a.i./ ha	111.60	323.21	333.20	329.95	326.72
T_4:- Hand weeding (20 and 40 DAT)	114.00	325.40	335.40	332.15	328.90
T_5:- Weed free (Till mature)	115.40	330.80	341.00	337.70	334.40
T_6:- Weedy check	108.00	241.60	249.00	246.60	244.20
SEm±	4.25	11.32	10.61	11.55	9.93
CD at 5%	NS	34.11	31.98	34.82	29.93

The data pertaining to the number of tillers are summarized in Table 2. In weed management practices the number of tillers m^{-1} row length was found significant at all stages crop growth except 30 days after transplanting.

Number of tillers (m^{-1}) was found significantly higher with weed free till mature (T_5) treatment over Pretilachlor @ 1.25 Kg ha^{-1}(PE) (T_1) and weedy check (T_6) and at par with other rest treatments at 60 DAT , 90 DAT, 120 DAT and At harvest. Table 2. Tillers (m^{-1} row length) as influenced by Weed management at different growth stages of rice.

The total number of tillers was increase significantly with an increase in nutrient level. The scrutiny of result for number of tillers m^{-2} indicates that the crop sown with weed free till mature (T_5) recorded higher number of tillers till the end of life process. The highest tillers m^{-2} at flowering might due to higher availability of nutrient by weed management which facilitated proper synchronized tillering. Similar results were reported by Azad and Lehriya (2001) [5], Saidu *et al.* (2012) [6] and Verma *et al.* (2017) [7].

Table 3: Dry matter accumulation (g/m^2) as influenced by weed management at various growth stages of rice.

Treatments	Dry matter accumulation (g m^{-2})				
	30 DAT	60 DAT	90 DAT	120 DAT	At harvest
T_1:- Pretilachlor @ 1.25 Kg/ha	215.02	585.60	985.66	1035.03	1159.62
T_2:- Bispyribac sodium @ 25g a.i./ hac.	217.02	616.50	1037.69	1089.61	1220.80
T_3:- Pretilachlor @ 1.25 Kg /ha + Bispyribac sodium @ 25g a.i. / ha	218.80	666.75	1122.26	1178.41	1320.30
T_4:- Hand weeding (20 and 40 DAT)	220.00	670.00	1127.78	1184.20	1326.80
T_5:- Weed free (Till mature)	223.00	696.20	1171.81	1230.40	1378.60
T_6:- Weedy check	209.00	454.25	746.56	802.80	899.50
SEm±	7.44	21.61	39.48	41.46	45.63
CD at 5%	NS	65.13	119.01	124.96	137.53

Data belong to dry matter accumulation (g/m^2) recorded at various growth stages are presented in Table 3. Perusal of data clearly reveals that dry matter production increased with increase in the age of the crop up to maturity.

Dry matter accumulation was affected significantly due to weed management. Among weed management, the maximum dry matter accumulation was noticed with weed free treatment (T_5) which was significantly superior over Pretilachlor @ 1.25 Kg per hectare (T_1) and Bispyribac sodium @ 25g a.i. per hectare (T_2) and Weedy check at all stages of crop growth except 30 days stage.

And it was at par with (T_3) Pretilachlor @ 1.25 Kg per hectare + Bispyribac sodium @ 25g a.i./ hectare and (T_4) Hand weeding (20 and 40 DAT) at 60, 90 ,120 DAT and at harvest.

However, weedy check treatment recorded significantly the lowest value of dry matter accumulation at all stages of crop growth.

Weed management had significant effect on dry matter accumulation under various treatments at different growth stages of rice except 30 DAT stage. Crop sown with weed free till mature treatment (T_5) recorded the higher dry matter accumulation and it was at par with (T_3) Pretilachlor @ 1.25 Kg ha^{-1}(PE) + Bispyribac sodium @ 25g a.i. ha^{-1} (POE) and (T_4)Hand weeding (20 and 40 DAT) at 60, 90,120 DAT and at harvest. This results is in similar with the observations of Awang *et al* (2016) [8] and Moe *et al.* (2017) [9].

Table 4: Leaf area index as influenced by weed management at different growth stages of rice

Treatments	Leaf area index		
	30DAT	60 DAT	90 DAT
T_1:- Pretilachlor @ 1.25 Kg/hac.	2.08	4.38	4.83
T_2:- Bispyribac sodium @ 25g a.i.per hectare	2.07	4.43	4.91
T_3:- Pretilachlor @ 1.25 Kg/hac.+Bispyribac sodium @ 25g a.i.per hectare	2.12	4.61	5.12
T_4:- Hand weeding (20 and 40 DAT)	2.14	4.70	5.20
T_5:- Weed free (Till mature)	2.18	5.05	5.60
T_6:- Weedy check	1.95	3.70	4.10
SEm±	0.07	0.14	0.17
CD at 5%	NS	0.44	0.52

Leaf area index recorded at various growth stages are presented in Table 4. Perusal of data clearly reveals that Leaf area index increased with increase in the age of the crop up to maturity.

Leaf area index was affected significantly due to weed management. In weed management practices the Leaf area index was found significant at all stages crop growth except 30 days after transplanting.

At 60 DAT weed free (till mature) (T_5) treatment found significant over Pretilachlor @ 1.25 Kg per hectare (T_1) , Bispyribac sodium @ 25g a.i.per hectare (T_2) , Pretilachlor @ 1.25 Kg per hectare + Bispyribac sodium @ 25g a.i. per hectare (T_3) and Weedy check (T_6) and at par with Hand weeding (20 and 40 DAT) (T_4) .

At 90 DAT weed free (till mature) (T_5) treatment found significant over Pretilachlor @ 1.25 Kg/hac.(T_1) , Bispyribac sodium @ 25g a.i. per hectare (T_2) and Weedy check (T_6) And at par with Pretilachlor @ 1.25 Kg/hac. + Bispyribac sodium @ 25g a.i. per hectare (T_3) and Hand weeding (20 and 40 DAT) (T_4).

There was significant increase in LAI with weed free (till mature) (T_5). Further, it was noted that all treatments produced higher LAI over control at 60 and 90 DAT. Treatment weed free (till mature) (T_5) recorded higher LAI which was at par with treatment Hand weeding (20 and 40 DAT) (T_4) while significant over rest of the treatments at 60 DAT. Treatment weed free (till mature) (T_5) recorded higher LAI which was at par with treatment Pretilachlor @ 1.25 Kg ha^{-1}(PE) + Bispyribac sodium @ 25g a.i. ha^{-1} (POE) and Hand weeding (20 and 40 DAT) (T_4) while significant over rest of

the treatments at 90 DAT. Higher LAI 5.60 was found with treatment free (till mature) (T_5) and lowest under treatment Weedy check (T_6) with 4.10. This was might be attributed to a greater number of tillers per running meter and increased plant height, which ultimately increased the size and number of green leaves due to more favorable utilization of nutrient and thus contributed to higher leaf area index. Similar result was reported by Moe *et al.* (2017) [10].

Table 5: Yield attributes of rice as influenced by weed management

Treatments	Effective tillers /m²	Panicle / m²	Panicle length (cm)	Panicle weight (gm)	No. of grains per panicle	Grains weight per panicle (gm)	Test weight (gm)
T_1:- Pretilachlor @ 1.25 Kg per hectare	272.01	266.02	19.41	1.93	78.00	1.75	22.42
T_2:- Bispyribac sodium @ 25g a.i. per hac.	279.00	274.10	19.80	1.98	80.00	1.80	22.45
T_3:- Pretilachlor @ 1.25 Kg/ ha + Bispyribac sodium @ 25g a.i per hectare	297.00	291.01	20.00	2.06	83.01	1.87	22.50
T_4- Hand weeding (20 and 40 DAT)	299.00	293.00	20.20	2.06	85.00	1.87	22.55
T_5:- Weed free (Till mature)	304.00	298.00	20.60	2.13	88.00	1.94	22.55
T_6:- Weedy check	222.00	218.00	18.20	1.80	76.00	1.64	22.20
SEm±	9.82	10.42	0.73	0.07	2.78	0.06	0.77
CD at 5%	29.60	31.41	NS	0.20	NS	0.18	NS

Yield attributes and yield

Weed free (T_5) up to till mature recorded significantly maximum number of effective tillers m^{-2} (304.00) followed by Pretilachlor @ 1.25 Kg per hectare (T_1) , Bispyribac sodium @ 25g a.i./hac. (T_2) and Pretilachlor @ 1.25 Kg/ ha + Bispyribac sodium @ 25g a.i.per hectare (T_3) and Hand weeding (upto 40 DAT) (T_4) of the treatment were at par . The lowest effective tillers were recorded with weedy check (T_6).

Panicle (m^2) was affected significantly due to weed management treatment. Among the weed management treatment significantly maximum Panicle (m^2) was recorded in weed free (till mature) as compare to Pretilachlor @ 1.25 kg a.i per hectare (T_1). while at par with Bispyribac sodium @ 25g a.i./ha (T_2) and Pretilachlor @ 1.25 Kg per hectare + Bispyribac sodium @ 25g active ingredient per hectare (T_3) and Hand weeding (upto 40 DAT) (T_4). Significantly the lowest Panicle (m^2) was recorded with weedy check (T_6).

A critical examination over data presented in Table 5 showed that higher panicle length (20.60 cm) was recorded with weed free (till mature) (T_5) over the weedy check (T_6) which was at par with other rest treatments.

Critical appraisal of data presented in Table 5 showed that higher panicle weight (2.13 g) was recorded with weed free (till mature) (T_5) which was at par with Bispyribac sodium @ 25g a.i./ha (T_2) and Pretilachlor @ 1.25 Kg per hectare + Bispyribac sodium @ 25g a.i. per hectare (T_3) and Hand weeding (upto 40 DAT) (T_4) while significant over rest of the treatment during the course of investigation.

Data pertaining to number of grain $panicle^{-1}$ are presented in Table 5. Perusal of Table 4.5 reveals that the higher number of grains panicle-1 (88.00) was recorded weed.

free (till mature) (T_5). Weed free (till mature) (T_5) was found higher which was at par with Bispyribac sodium @ 25g a.i.per hectare (T_2) and Pretilachlor @ 1.25 Kg/ha+ Bispyribac sodium @ 25g active ingredient per hectare (T_3) and Hand weeding (upto 40 DAT) (T_4) while significant over rest of the treatments during the course of investigation.

Critical appraisal of data presented in Table 5. showed that higher grains weight per panicle (1.94g) was recorded with weed free (till mature) (T_5). However, the grains weight $panicle^{-1}$ with treatment weed free (till mature) (T_5) was at par with Bispyribac sodium @ 25g a.i.per hectare (T_2) and Pretilachlor @ 1.25 Kg per hectare + Bispyribac sodium @ 25g a.i./hac. (T_3) and Hand weeding (upto 40 DAT) (T_4) while significant over rest of the treatments during the course of investigation.

The data recorded on Test weight have been presented in Table 5. Test weight was not affected significantly by different weed management practices The economic yield of the rice depends upon the various yield attributes like, panicle weight (g), numbers of grains $panicle^{-1}$, grains weight $panicle^{-1}$ and test weight (g). The scrutiny of data of yield attributes clearly reveals that there was a significant impact of various nutrient management practices on yield attributing character's like as panicle length (cm), panicle weight (g), numbers of grains $panicle^{-1}$, grains weight $panicle^{-1}$. However, the panicle length (cm) and test weight (g) was not affected significantly. Mainly test weight is controlled by genetic makeup of the variety. The weed management with weed free (till mature) (T_5) recorded the significantly higher panicle length (cm), panicle weight (g), numbers of grains panicle-1, grains weight panicle-1which might due to weed management practices. The weed management amng herbicide with Pretilachlor @ 1.25 Kg ha^{-1}(PE) + Bispyribac sodium @ 25g a.i. ha^{-1} (POE) (T_3) recorded the significantly higher panicle length (cm), panicle weight (g), numbers of grains panicle-1, grains weight panicle-1which might due to weed management practices. Similar responses were also recorded by Krishna kumar *et al.* (2005) [11] and Uma Shankar *et al.* (2005) [12].

Table 6: Yield of rice as influenced by weed management of rice.

Treatments	Grain Yield (q/hac.)	Straw Yield (q/hac.)	Biological Yield (q/hac.)	Harvest Index (%)
T_1:- Pretilachlor @ 1.25 Kg per hectare	46.50	69.46	115.97	40.08
T_2:- Bispyribac sodium @ 25g a.i. per hectare	49.21	72.88	122.08	40.31
T_3:- Pretilachlor @ 1.25 Kg/hac. + Bispyribac sodium @ 25g a.i.per hectare	54.01	78.03	132.03	40.90
T_4- Hand weeding (20 and 40 DAT)	54.40	78.28	132.68	41.00
T_5:- Weed free (Till mature)	56.80	81.06	137.86	41.20
T_6:- Weedy check	35.80	54.15	89.95	39.80
SEm±	1.74	2.76	4.56	1.38
CD at 5%	5.23	8.31	13.75	NS

Critical observation of the data recorded on grain yield (q ha^{-1}) have been summarized in Table 6. The higher grain yield of 56.80 q ha^{-1} was recorded with treatment weed free (till mature) (T_5) which was significant over the treatments Pretilachlor @ 1.25 Kg ha^{-1}(PE) (T_1), Bispyribac sodium @ 25g a.i. ha^{-1} (POE) (T_2) & weedy check (T_6) and at par with all the rest treatments. The lowest grain yield was recorded with treatment weedy check (T_6) with 35.80 q ha^{-1}.

The data recorded on straw yield (q. per hac.) have been summarized in Table 6. The higher straw yield of 81.06 q ha^{-1} was recorded with weed free (till mature) (T_5) which was significant over the treatments Pretilachlor @ 1.25 Kg ha^{-1}(PE) (T_1) & weedy check (T_6) and at par with other rest treatments. The lowest straw yield was recorded with treatment weedy check (T_6) with 54.15 q ha^{-1}.

Critical observation of the data recoded on biological yield (q ha^{-1}) have been summarized in Table 6. The highest biological yield of 137.86 q ha^{-1} was recorded treatment with weed free (till mature) (T_5) which was significant over the treatments Pretilachlor @ 1.25 Kg ha^{-1}(PE) (T_1), Bispyribac sodium @ 25 g a.i. ha^{-1} (POE) (T_2) & weedy check (T_6) And at par with other rest treatments. The lowest biological yield was recorded with treatment weedy check (T_6) with 89.95 q ha^{-1}.

Harvest index indicates the relationship between economic yield and biological yield. Perusal of data presented in Table 6. It is clearly revealed from the data there was variation in harvest index with various treatments but it could not reach to the level of significance.

The height grain, straw, biological yield and harvest index was recorded with treatment weed free (till mature) (T_5) which was significant over the treatments Pretilachlor @ 1.25 Kg ha^{-1}(PE) (T_1), Bispyribac sodium @ 25g a.i. ha^{-1} (POE) (T_2) & weedy check (T_6) And at par with rest treatments. This result was closely justified with report of Siavoshi (2010) [13], Yadav and Yadav (2015) [14] and Thulasi *et al.* (2016) [15].

Table 7: Economics of each treatment in rice crop.

Treatments	Cost of cultivation (Rs. ha^{-1})	Gross return (Rs. ha^{-1})	Net return (Rs. ha^{-1})	B:C ratio
T_1:- Pretilachlor @ 1.25 Kg per hectare	36079	107700	71621	1.98
T_2:- Bispyribac sodium @ 25g a.i. per hectare	37829	113769.6	75940.6	2.00
T_3:- Pretilachlor @ 1.25 Kg/hac. + Bispyribac sodium @ 25g a.i.per hectare	38704	124281	85577	2.21
T_4- Hand weeding (20 and 40 DAT)	78263.28	125103.2	46839.92	0.59
T_5:- Weed free (Till mature)	99792.92	99792.92	30627.48	0.30
T_6:- Weedy check	35204	83119.4	47915.4	1.36

Economics

The data presented in Table 7 further indicated that the maximum net return (`85577.00 ha$^{-1}$) was noted with Pretilachlor @ 1.25 Kg ha$^{-1}$+ Bispyribac sodium @ 25g a.i. ha$^{-1}$ ($T_3$) followed by Bispyribac sodium @ 25g a.i. ha$^{-1}$ ($T_2$) `75940.6 Rs. ha^{-1} and being lowest (`30627.48 Rs. ha^{-1}) under weed free (till mature) (T_5).

A perusal of data presented in Table 7, revealed that the highest benefit: cost ratio of 2.21 was noted under treatment Pretilachlor @ 1.25 Kg ha^{-1}(PE) + Bispyribac sodium @ 25g a.i. ha^{-1} (POE) (T_3) closely followed by Bispyribac sodium @ 25 g a.i. ha^{-1} (POE) (T_2) (2.00) and being lowest under the 0.30 weed free (till mature) (T_5).

Cost of cultivation was recorded highest in weed free (till mature) (T_5) plots and minimum in weedy check (T_6) plots. Maximum cost of cultivation was recorded from weed free (till mature) (T_5) Rs. 99792.92 recorded minimum cost of cultivation over rest of the treatments.

Highest gross return Rs. 125103.2 Rs. ha^{-1} recorded with (T_4) Hand weeding (20 and 40 DAT) and highest net return Rs. 85577 ha^{-1} also recorded with (T_3) Pretilachlor @ 1.25 Kg ha^{-1}(PE) + Bispyribac sodium @ 25g a.i. ha^{-1} (POE) However, the highest benefit: cost ratio 2.21per rupee invested was recorded from (T_3) Pretilachlor @ 1.25 Kg ha^{-1}(PE) + Bispyribac sodium @ 25g a.i. ha^{-1} (POE**)** Das *et al.* (2017) [16].

Reference

1. Awang A, Jalloh MB, Kuan PS, Itoh K, Mitsui T, Alidin MD. Effect of Adding Appropriate Mixture of NPK and Chicken Manure on Growth and Yield of TR-9 Paddy Variety on Beach Ridges Interspersed with Swales (BRIS) Soil. Bulletin of Faculty of Agriculture, Niigata University 2016;68:43-48.
2. Azad BS, Lehria SK. Yield maximization of rice through integrated nutrient management under irrigated condition. Annals of Agriculture Research 2001;22(4):471-475.
3. Christos A, Damalas Kico V, Illias G. Bispyribac sodium efficacy on early water grass and late water grass as affected by application of selected rice herbicides. Weed Tech 2008;22:622-627.
4. Jayadeva HM, Bhairappanavar ST, Somashekharappa PR, Rangaswamy BR. Efficacy of azimsulfuron for weed control in transplanted rice. Indian J Weed Science, 2009;41(3, 4):172-175.
5. Krishnakumar S, Saravanan A, Ramesh K, Natarajan SK, Veerabadran V, Mani S. Organic farming: Impact on rice (*Oryza sativa* L.) productivity and soil health. Asian J Plant Sciences 2005;4(5):510-51.
6. Moe, Kyi Kumudra MW, Win KK, Yamakawa T. Combined Effect of Organic anures and Inorganic Fertilizers on the Growth and Yield of Hybrid Rice (Palethwe-1). American J Plant Sciences 2017;8:1022-1042.
7. Nath CP, Pandey PC. Evaluation of herbicides on grain yield and nutrient uptake in rice (*Oryza sativa* L.). Bioinfolet 2013;10:282- 87.
8. Singh P, Singh P, Singh SS. Response of aromatic rice (Pusa Basmati 1) to establishment methods, fertility levels and weed management practices. Indian J Weed Sci 2007;39(1, 2):32- 35
9. Thulasi V, Moossa PP, Narayanankutty MC. Influence of long-term application of farm yard manure and in situ green manures on crop productivity and soil organic carbon under rice-rice system in a typichaplustalf. Advance Research J Crop Improvement 2016;7(1):111-115.
10. Umashankar R, Babu C, Thavaprakash N, Prakash R. Integrated nutrient management practices on yield attributes and yield of direct seeded low land rice. Crop Research 2005;29(2):175-178.

11. Verma JK, Ali A, Harikesh, Shivam. Effect of various nutrient management modules on growth and yield traits of high yielding varieties of Rice (*Oryza sativa* L.). J Pharmacognosy and Phytochemistry 2017;6(5):697-701
12. Yadav K, Yadav RB. Production and profitability of basmati rice (*Oryza sativa* L.) in response to integrated use of organic and inorganic sources of nutrients. Indian Society of Agronomy. Indian J Agronomy 2015; 60(4):610-613.