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Effect of Nitrogen Schedule and Weed Management Practices on Yield Attributing Characters and Yield of Transplanted Hybrid Rice (*Oryza sativa* L.)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The experiment conducted during *kharif* season of 2018-19 and 2019-20 at student instructional farm of Chandra Shekhar Azad University of Agriculture and Technology Kanpur, to study on productivity and resource use efficiency of transplanted hybrid rice in relation to weed management and nitrogen application. The experiment was laid out in split-plot design keeping nutrient management practices, viz. N_1-150 kg Nitrogen ha^{-1}; 3 equal split application at transplanting, 25 and 45 DAT, N_2-150 kg nitrogen ha-[1]; 4 equal split application at transplanting ,25, 45 and 60 DAT, N_3-180 kg nitrogen ha-[1]; 3 equal Split application at transplanting ,25 and 45 DAT. N_4-180 kg nitrogen ha-[1]; 4 equal Split application at transplanting, 25, 45 and 60 DAT in main plots, and weed management practices, viz. W_1- Un-weeded (weedy check), W_2– Two hand weeding at 20 and 40 DAT, W_3– Anilophos @ 0.40 kg *a.i.* ha^{-1} *fb* weeding by cono-weeder at 30 DAT, W_4-Pretilachlor @ 0.75 kg *a.i.* ha^{-1} *fb* weeding by cono-weeder at 30 DAT, W_5- Anilophos @ 0.40 kg *a.i.* ha^{-1} *fb* fenoxaprop-ethyl @ 80 g *a.i.* ha^{-1} at 25-30 DAT and W_6- Pretilachlor @0.75kg *a.i* ha^{-1} *fb*

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fenoxaprop-ethyl @ 80g *a.i.* ha^{-1} at 25-30 DAT in sub plots with three replications. Significantly higher yield attributes and yield (62.14 q/ha) were found under N_4 treatment than others and was comparable with N_1. Similarly, highest yield attributing characters and grain yield (67.84 q/ha) of hybrid rice was noticed with W_2 treatment.

Keywords: Cono-weeder; fenoxaprop-ethyl; pretilachlor; test weight and yield.

1. INTRODUCTION

Rice (*Oryza sativa* L.) is a most important cereal crop, grown under aquatic condition and mostly under submergence or variable ponding conditions. It belongs to family Poaceae (*Graminae*). It is a most important staple food of about more than 60% of total world population. About 90% of the world's rice is produced and consumed in Asia [1]. Rice is cultivated world-wide over an area of about 163.20 million ha with an annual production of about 758.90 million tone. (503.80 million tons, milled basis) and productivity 4.60 ton per hectare in [2]. About 90% of all rice grown in the world is produced and consumed in the Asian region. It accounts 43% of total food grain production and 55% of cereal production in the India. It is a high caloric food, which contain 75% starch, 6-7% protein, 2-2.5% fat, 0.8% cellulose and 5-9% ash. Rice production in India is an important part of the national economy. India is an important part of the national economy. The present strategy of increasing food production essentially involves the balance use of fertilizer to rice, because all the varieties give their full yield potential with adequate supply of nutrients. Among various essential nutrient elements the nitrogen plays very vital role for growth and metabolic process in rice plants.

Nitrogen is also responsible for more leaf area and dry matter production due to higher rate of cell division and cell elongation. Inadequate nitrogen application adversely affects the grain production while excess nitrogen may lead to relatively higher crop growth. Significant increase in grain yield of rice has been reported up to 200 kg N ha^{-1} [3].

Weeds are regarded as one of the major limiting factors of the crop production [4]. Weeds are responsible for heavy rice yield losses, to the extent of complete crop loss under extreme conditions. Out of the losses due to various biotic stresses, weeds are known to account for nearly one third. Weed competition would be less severe under transplanting than those under direct seeding [5,6]. Uncontrolled weeds reduced the grain yield by 75.8%, 70.6% and 62.6%under dry-seeded rice (DSR), wet seeded rice (WSR) and transplanted rice (TPR), respectively, [7].

Mechanical weeding in transplanted rice, apart from manually, weeding is also done by using a mechanical hand weeder (rotating hoe or cono-weeder) with no herbicide use. This practice incorporates the weeds into the soil which serve as green manure [8-10]. Moreover, mechanical weeding becomes less hard in successive years as skill is gained in the methods and as better implements is developed. It eliminates the use of herbicides hence providing health benefits for all concerned persons like the farm worker and the consumer there is no pollution of the environment and ground water found that among the weed management practices, mechanical hoeing using cono-weeder (twice at 15 and 30 days after transplanting) reduced the total weed population and dry weight significantly at all the crop growth stages than weedy check but it was at par with sequential application of herbicides and also recorded maximum grain yield (productivity) over other treatments under Jammu region [11].

Timely weed control is imperative for realizing desired level of crop productivity. In transplanted rice, *Echinochloa colona, Echinochloa crus-galli, Ischaemum rugosum, Caesulia axillaris, Commelina* spp., *Cyperus* spp. and *Fimbristylis milliacea*are found to be the major weeds [12,13]. Weed shift from grasses to non-grasses and annual sedges is being observed in transplanted rice fields due to continuous use of butachlor, anilofos and pretilachlor in most rice growing areas of the country. These herbicides provide effective control of annual grasses when applied as pre-emergence 3-4 days after rice transplanting.

2. MATERIALS AND METHODS

2.1 Experimental Sites

The experiment was conducted during *kharif* season of 2018-19 and 2019-20 at student's Instructional farm, C.S.A. University of

Agriculture and Technology, Kanpur Nagar (U.P.). The field was well leveled and irrigated by tube well. The farm is situated at main campus of the university, in the west northern part of Kanpur city under sub-tropical zone in v^{th} agroclimatic zone (central plain zone).

2.2 Edaphic Condition

The soil was moist, well drained with uniform plane topography. The soil of the experimental field was alluvial in origin, sandy loam in texture and slightly alkaline in reaction having pH 7.71 (1:2.5 soil: water suspension method given by Jackson, [14]), electrical conductivity 0.31 dSm^{-1} (1:2.5 soil: water suspension method given by Jackson, [14]), Organic carbon percentage in soil is 0.35 per cent (Walkley and Black's rapid titration method given by Walkley and Black, [15]), with available nitrogen 172.2 kg ha^{-1} (Alkaline permanganate method given by Subbiah and Asija, [16]), available phosphorus as sodium bicarbonate-extractable P was 12 kg ha^{-1} (Olsen's calorimetrically method, Olsen *et al.,* [17]) available potassium was 156.4 kg ha^{-1} (Flame photometer method given by Hanwey and Heidel, [18]).

2.3 Detail of Treatments and Design

The experiment was conducted in split-plot design with three replications. The experiment comprised of four treatments in main plots, viz. N_1:150 kg Nitrogen ha^{-1}; 3 equal split application at transplanting, 25 and 45 DAT, N_2:150 kg nitrogen ha^{-1}; 4 equal split application at transplanting ,25, 45 and 60 DAT, N_3:180 kg nitrogen ha^{-1}, 3 equal split application at transplanting, 25 and 45 DAT. N_4:180 kg nitrogen ha^{-1}, 4 equal split application at transplanting, 25, 45 and 60 DAT in main plots, and 6 treatments in sub plot such as W_1: Un-weeded (weedy check), W_2: Two time hand weeding at 20 and 40 DAT, W_3: anilophos @ 0.40 kg *a.i*. ha^{-1} *fb* weeding by cono-weeder at 30 DAT, W_4: pretilachlor @ 0.75 kg *a.i.* ha^{-1} weeding by cono-weeder at 30 DAT, W_5 : anilophos @ 0.40 kg *a.i.* ha^{-1} *fb* fenoxaprop-ethyl @ 80 g *a.i.* ha^{-1} at 25-30 DAT and W_6 : pretilachlor @0.75kg *a.i* ha^{-1} *fb* fenoxaprop-ethyl @ 80g *a.i.* ha^{-1} at 25-30 DAT.

2.4 Fertilizers Application

After making the individual experimental unit smaller plot the recommended dose of fertilizer as per treatment was applied, The individual nutrients viz. N, P_2O_5, K_2O, Sulphur and Zinc was given in the form of Urea, DAP, MOP, elemental Sulphur and Zinc sulphate were mixed in soil before sowing. The nitrogen was given as basal (as per treatment) and in three - four split doses as topdressing at different days of intervals.

2.5 Application of Herbicide

The doses of herbicides were calculated as per treatments. The spray volume was calculated on the test run basis and was found 400 liters of water ha^{-1}. The desired rate of herbicides and water was calculated for each plot and applied using knap – sack sprayer fitted with flat fan nozzle. For weed free treatment, hand weeding at 20 and 40 days after transplanting was done to maintain weed free condition.

2.6 Data Collection

2.6.1 Number of effective tillers $hills^{-1}$

Effective tillers were counted from sampled row of each plots and expressed as number of effective tillers per meter row length.

2.6.2 Panicle length (cm)

Ten spikes were randomly selected from tagged plants in each plot and their length (cm) was measured from neck node to tip of the top most spikes and average panicle length was calculated.

2.6.3 Number of grains $panicle^{-1}$

The grains of twenty selected panicles were counted and averaged to get the number of grains $panicle^{-1}$.

2.6.4 Grain weight $panicle^{-1}$ (g)

Ten randomly selected panicles were taken out from each plot and threshed and grain weight was taken (g $panicle^{-1}$).

2.6.5 1000 grain weight (g)

One thousand grains were counted from representative sample of each treatment drawn from winnowed and cleaned produce, and their weight was expressed in gram.

2.6.6 Grain yield (q ha^{-1})

After threshing of net plot area of each treatment, the grain was separated from the straw and cleaned. The grain yield was recorded plot wise, adjusted at 14% moisture level and there after expressed in q ha^{-1}.

2.6.7 Straw yield (q ha^{-1})

After threshing of net plot area of each treatment, straw yield was recorded plot wise by subtracting grain yield from bundle weight and thereafter expressed in q ha^{-1}.

2.6.8 Biological yield (q ha^{-1})

All above ground plant parts harvested from net plot area were carefully bundled, tagged and taken to the threshing floor separately. The individual bundle was weighed after complete drying in the sun and the biological yield per plot was then converted into q ha^{-1}.

2.6.9 Harvest index (%)

The harvest index was computed in term of grain yield expressed as percentage of biological yield (straw + grain) based on the per hectare yields.

$$\text{Harvest index (HI)} = \frac{\text{Grain Yield}}{\text{Biological yield}} \times 100$$

2.7 Statistical Analysis

The growth parameters and yields were recorded and analyzed as per Gomez and Gomez [19] the tested at 5% level of significance to interpret the significant differences.

3. RESULTS AND DISCUSSION

3.1 Yield Attributing Characters

3.1.1 No. of effective tillers $hills^{-1}$

The data pertaining to no. of effective tillers $hills^{-1}$ as influenced by nitrogen schedule and weed management treatments are presented in Table 1. Among nitrogen schedule, nitrogen application at 180 kg nitrogen ha^{-1}; 4 equal split application at transplanting, 25, 45 and 60 days after transplanting (N_4) produced maximum effective tillers $hills^{-1}$ which, was significantly superior to 150 kg nitrogen ha^{-1}; 3 equal split application at transplanting, 25 and 45 days after transplanting (N_1) and other nitrogen treatments, under pooled data of both the years. Sequential application of herbicides resulted in higher number of effective tillers $hills^{-1}$ compared to alone application of herbicides. Application of anilofos @ 0.40 kg *a.i.* ha^{-1} *fb* fenoxaprop-ethyl @ 80 g *a.i.* ha^{-1} at 30 days after transplanting (W_5) recorded maximum number of effective tillers $hills^{-1}$which was significantly superior to pretilachlor @ 0.75 kg *a.i.* ha^{-1}*fb* weeding by cono-weeder at 30 days after transplanting (W_4) under pooled of both the year data. The consequences of the current investigation are additionally in concurrence with the investigation of Kumar et al., [20] and Alagesan and Babu [21].

3.1.2 Panicle length (cm)

Nitrogen application at 180 kg nitrogen ha^{-1}; 4 equal split application at transplanting, 25, 45 and 60 days after transplanting (N_4) produced maximum panicle length which was significantly superior to all nitrogen treatments at pooled data of both the years. Sequential application of herbicides resulted in more panicle length compared to alone application of herbicides. Application of anilofos @ 0.40 kg *a.i.* ha^{-1} *fb* fenoxaprop-ethyl @ 80 g *a.i.* ha^{-1} at 30 days after transplanting (W_5) recorded maximum panicle length (29.32). The results of the present investigation are also in agreement with the findings of Das et al., [22]) and Alagesan and Babu [21].

3.1.3 No. of grains $panicle^{-1}$

Amongst various nitrogen schedule, nitrogen application at 180 kg nitrogen ha^{-1}; 4 equal Split application at transplanting, 25, 45 and 60 days after transplanting (N_4) recorded maximum (97.79) number of grains $panicle^{-1}$ which was significantly superior to all nitrogen treatments. Under sequential application of herbicides treatments, anilofos @ 0.40 kg *a.i.* ha^{-1} *fb* fenoxaprop-ethyl @ 80 g *a.i.* $ha\text{-}^{1}$ at 30 days after transplanting (W_5) recorded maximum grains $panicle^{-1}$ (95.93) which was significant to pretilachlor @ 0.75kg *a.i* ha^{-1}*fb* fenoxaprop-ethyl @ 80g *a.i.* ha^{-1} at 30 days after transplanting (W_6) (94.03) during (pooled) both the year of experiment. These results also confirms the findings of Rahman et al., [23], Devi and Sumathi [24] and Manhas et al., [25]).

3.1.4 Grains weight $panicle^{-1}$ (g)

Among various nitrogen schedule, nitrogen application at 180 kg nitrogen ha^{-1}; 4 equal split application at transplanting, 25, 45 and 60 days after transplanting (N_4) recorded maximum (2.64) grain weight panicle^{-1} which was significantly superior to all nitrogen treatments. However 150 kg nitrogen ha^{-1}; 3 equal split applications at transplanting, 25 and 45 days after transplanting (N_1) recorded (2.16) lowest value of grain weight panicle^{-1} under pooled data of both the year of experiment. Among weed management, anilofos @ 0.40 kg *a.i.* ha^{-1} *fb* fenoxaprop-ethyl @ 80 g *a.i.* ha^{-1} at 30 days after transplanting (W_5) recorded maximum grain weight panicle^{-1} (2.54 g) which was significantly superior to pretilachlor @ 0.75 kg *a.i.*ha^{-1}*fb* fenoxaprop-ethyl @ 80 g *a.i.* ha^{-1} at 30 days after transplanting (2.37g)(W_6), and rest of herbicides treatments during (pooled) both the year of experimentation. The consequences of the current investigation are additionally in concurrence with the investigation of Zaidi and Tripathi [26], Shi Li Hong et al., [27] and Hirzel et al., [28].

3.1.5 Test weight (g)

Nitrogen schedule, application of 180 kg nitrogen ha^{-1}; 4 equal split application at transplanting, 25, 45 and 60 days after transplanting (N_4) recorded maximum (27.61g) test weight which, was significantly superior to all nitrogen treatments, under pooled data of both the years. Under sequential application of herbicides treatments, anilofos @ 0.40 kg *a.i.* ha^{-1} *fb* fenoxaprop-ethyl @ 80 g *a.i.* ha^{-1} at 30 days after transplanting (W_5), recorded maximum test weight (27.30g) which was statistically significant to all herbicide treatments. However, pretilachlor @ 0.75kg *a.i.* ha^{-1}*fb* fenoxaprop-ethyl @ 80g *a.i.* ha^{-1} at 30 days after transplanting (W_6), statistically at par to anilofos @ 0.40 kg *a.i*. ha^{-1}*fb* weeding by cono-weeder at 30 days after transplanting (W_3) and pretilachlor @ 0.75 kg *a.i.* ha^{-1}*fb* weeding by cono-weeder at 30 days after transplanting (W_4), and weedy check (W_1), during experimentation. The results of the present investigation are also in agreement with the findings of Yadav et al., [29] and Choudhary et al., [30].

3.2 Productivity Parameters

3.2.1Grain yield (q ha^{-1})

Among nitrogen schedule, nitrogen application at 180 kg nitrogen ha^{-1}; 4 equal split applications at transplanting, 25, 45 and 60 days after transplanting (N_4) produced maximum grain yield which was significantly superior to all nitrogen treatment, under pooled data of both the years. The grain yield under N_4 treatment was found higher by 8.17%, 4.79%, 1.75%, over 150 kg nitrogen ha^{-1}; 3 equal split application at transplanting, 25 and 45 days after transplanting (N_1), 150 kg nitrogen ha^{-1}; 4 equal split application at transplanting, 25, 45 and 60 days after transplanting (N_2) and 180 kg nitrogen ha^{-1}; 3 equal split application at transplanting, 25 and 45 days after transplanting (N_3), respectively, under pooled data of experiment. Among herbicidal treatments, the maximum grain yield (65.99 q ha^{-1}) was recorded under, anilofos @ 0.40 kg *a.i.* ha^{-1}*fb* fenoxaprop-ethyl @ 80 g *a.i.* ha^{-1} at 30 days after transplanting (W_5) which, was significantly superior to pretilachlor @ 0.75 kg *a.i.* ha^{-1}*fb* weeding by cono-weeder at 30 days after transplanting (W_4). The consequences of the current investigation are additionally in concurrence with the investigation of Singh et al. [31] and Haque and Haque [32].

3.2.2 Straw yield (q ha^{-1})

Nitrogen application at 150 kg nitrogen ha^{-1}; 3 equal split applications at transplanting, 25 and 45 days after transplanting (N_1) produced lowest straw yield. However, 180 kg nitrogen ha^{-1}; 4 equal Split application at transplanting, 25, 45 and 60 days after transplanting (N_4) produced maximum straw yield which was significantly superior to all nitrogen treatments followed by application of 150 kg nitrogen ha^{-1}; 3 equal split application at transplanting, 25 and 45 days after transplanting (N_3), under pooled data of both the years. Among sequential application of herbicides, the maximum straw yield recorded under anilofos @ 0.40 kg *a.i.* ha^{-1} *fb* fenoxaprop-ethyl @ 80 g *a.i.* ha^{-1} at 30 days after transplanting (W_5) which was significantly superior to anilofos @ 0.40 kg *a.i*. ha^{-1}*fb* weeding by cono-weeder at 30 days after transplanting (W_3) and pretilachlor @ 0.75 kg *a.i.* ha^{-1}*fb* weeding by cono-weeder at 30 days after transplanting (W_4) during pooled data of experiment. The results of the present investigation are also in agreement with the findings of Kumar et al. [33] and Singh et al. [34].

3.2.3 Biological yield (q ha^{-1})

The highest biological yield was recorded under nitrogen application at 180 kg nitrogen ha^{-1}; 4 equal Split application at transplanting, 25, 45 and 60 days after transplanting (N_4) which was significantly superior to all nitrogen treatments. Among weed management treatment two, hand weeding at 20 and 40 days after transplanting recorded significantly maximum biological yield. However, anilofos @ 0.40 kg *a.i.* ha^{-1}*fb*

Table 1. Effect of nitrogen schedule and weed management practices on yield attributing characters of transplanted hybrid rice

Treatments	No. of effective tillers hills^{-1}			Panicle length(cm)			No. of grain panicle^{-1}			Grain weight panicle^{-1}			1000 grain weight (g)		
	2018	**2019**	**Pooled**	**2018**	**2019**	**Pooled**	**2018**	**2019**	**Pooled**	**2018**	**2019**	**Pooled**	**2018**	**2019**	**Pooled**
N_1	12.88	13.13	13.00	26.89	26.97	26.93	88.01	87.70	87.85	2.15	2.16	2.16	25.96	26.12	26.04
N_2	13.54	13.80	13.67	28.15	28.27	28.21	92.11	92.51	92.31	2.34	2.36	2.35	27.06	27.22	27.14
N_3	13.91	14.18	14.04	29.04	29.16	29.10	95.01	95.43	95.22	2.49	2.52	2.50	27.12	27.45	27.28
N_4	14.33	14.52	14.43	29.82	29.95	29.88	97.57	98.00	97.79	2.63	2.65	2.64	27.56	27.66	27.61
S.Em. ±	0.05	0.04	0.04	0.03	0.11	0.08	0.37	0.35	0.23	0.003	0.004	0.004	0.06	0.08	0.03
CD at 5%	0.16	0.15	0.13	0.12	0.39	0.30	1.30	1.24	0.81	0.011	0.016	0.016	0.21	0.27	0.11
W_1	11.83	12.08	11.95	26.74	26.79	26.77	87.51	86.84	87.18	2.13	2.14	2.14	26.34	26.49	26.41
W_2	14.76	15.04	14.90	30.18	30.31	30.24	98.74	99.18	98.96	2.69	2.72	2.71	28.24	28.33	28.29
W_3	13.88	14.00	13.94	28.68	28.80	28.74	92.36	92.76	92.56	2.43	2.45	2.44	26.64	26.79	26.72
W_4	13.34	13.60	13.47	27.78	27.90	27.84	90.89	91.28	91.08	2.28	2.30	2.29	26.54	26.70	26.62
W_5	14.33	14.61	14.47	29.25	29.38	29.32	95.72	96.14	95.93	2.53	2.55	2.54	27.10	27.51	27.30
W_6	13.84	14.11	13.98	28.23	28.35	28.29	93.83	94.24	94.04	2.36	2.38	2.37	26.69	26.85	26.77
S.Em. ±	0.050	0.057	0.049	0.097	0.109	0.112	0.36	0.35	0.31	0.009	0.009	0.009	0.10	0.10	0.09
CD at 5%	0.144	0.163	0.140	0.278	0.312	0.320	1.02	1.01	0.88	0.026	0.026	0.026	0.28	0.28	0.26

Table 2. Effect of nitrogen schedule and weed management practices on yield and harvest index of transplanted hybrid rice

Treatments	Grain yield (q ha^{-1})			Straw yield (q ha^{-1})			Biomass yield (q ha^{-1})			Harvest index (%)		
	2018	2019	Pooled	2018	2019	Pooled	2018	2019	Pooled	2018	2019	Pooled
N_1	56.49	57.63	57.06	98.62	99.65	99.13	155.11	157.27	156.19	36.18	36.32	36.25
N_2	58.22	60.10	59.16	105.78	105.01	105.40	164.00	165.11	164.55	35.17	36.05	35.61
N_3	60.11	61.98	61.05	108.75	109.71	109.23	168.86	171.69	170.28	35.27	35.76	35.52
N_4	61.14	63.14	62.14	112.17	112.35	112.26	173.31	175.49	174.40	34.96	35.66	35.31
S.Em. ±	0.09	0.12	0.10	0.31	0.36	0.27	0.71	0.64	0.51	0.08	0.08	0.08
CD at 5%	0.32	0.43	0.36	1.09	1.28	0.95	2.51	2.25	1.80	N.S.	N.S	N.S
W_1	36.25	36.63	36.44	100.75	99.90	100.32	137.00	136.53	136.76	26.48	26.84	26.66
W_2	66.89	68.78	67.84	112.87	113.28	113.07	179.76	182.06	180.91	37.22	37.78	37.50
W_3	62.39	64.39	63.39	104.61	105.00	104.80	167.00	169.39	168.19	37.36	38.01	37.69
W_4	60.60	62.55	61.57	103.16	104.41	103.78	163.76	166.96	165.36	37.02	37.46	37.24
W_5	64.95	67.04	65.99	108.48	109.45	108.97	173.43	176.49	174.96	37.45	37.99	37.72
W_6	62.86	64.88	63.87	108.12	108.03	108.07	170.98	172.91	171.95	36.84	37.61	37.22
S.Em. ±	0.22	0.24	0.20	0.40	0.40	0.35	0.61	0.66	0.71	0.13	0.16	0.13
CD at 5%	0.62	0.68	0.57	1.14	1.15	1.01	1.75	1.89	2.03	N.S	N.S	N.S

***N_1**-150 kg nitrogen ha^{-1}; 3 equal split application at transplanting, 25 and 45 DAT*
***N_2**-150 kg nitrogen ha^{-1}; 4 equal split application at transplanting, 25, 45 and 60 DAT*
***N_3**-180 kg nitrogen ha^{-1}; 3 equal Split application at transplanting, 25 and 45 DAT*
***N_4**-180 kg nitrogen ha^{-1}; 4 equal Split application at transplanting, 25, 45 and 60 DAT*
***W_1-** Un-weeded (weedy check)*
***W_2**-Two hand weeding at 20 and 40 DAT*
***W_3**-Anilophos @ 0.40 kg a.i. ha^{-1} fb weeding by cono-weeder at 30 DAT*
***W_4**-Pretilachlor @ 0.75 kg a.i. ha^{-1} fb weeding by cono-weeder at 30 DAT*
***W_5**- Anilophos @ 0.40 kg a.i. ha^{-1} fb fenoxaprop-ethyl @ 80 g a.i. ha^{-1} at 25-30 DAT*
***W_6**- Pretilachlor @0.75kg a.i ha^{-1} fb fenoxaprop-ethyl @ 80g a.i. ha^{-1} at 25-30 DAT*

fenoxaprop-ethyl @ 80 g *a.i.* ha^{-1} at 30 days after transplanting (W_5) significantly at with pretilachlor @ 0.75 kg *a.i.* ha^{-1}*fb* weeding by cono-weeder at 30 days after transplanting (W_4). Whereas, application of pretilachlor @ 0.75kg *a.i.* ha^{-1}*fb* fenoxaprop-ethyl @ 80 g *a.i.* ha^{-1} at 30 days after transplanting (W_6) highly significant to anilofos @ 0.40 kg *a.i*. ha^{-1}*fb* weeding by cono-weeder at 30 days after transplanting (W_3),under pooled data of both the years. These results also confirms the findings of Jacob and Elizabeth [35] and Aminpanah et al., [36].

3.2.4 Harvest Index (%)

Nitrogen application at 150 kg nitrogen ha^{-1}; 3 equal split applications at transplanting, 25 and 45 days after transplanting (N_1) produced statistically highest harvest index. Lowest harvest index (35.31) was recorded under 180 kg nitrogen ha^{-1}; 4 equal split application at transplanting, 25, 45 and 60 days after transplanting (N_4). Among weed management treatments, anilofos @ 0.40 kg *a.i.* ha^{-1}*fb* fenoxaprop-ethyl @ 80 g *a.i.* ha^{-1} at 30 days after transplanting (W_5) and anilofos @ 0.40 kg *a.i*. ha^{-1}*fb* weeding by cono-weeder at 30 days after transplanting (W_3) recorded maximum harvest index in pooled data of both the year. However two hand weeded plot recorded (37.50) value of harvest index in pooled data of both the year. The consequences of the current investigation are additionally in concurrence with the investigation of Duary et al., [37] and Jaswal and Singh [38].

4. CONCLUSION

In view of the above conclusion, it is recommended that nitrogen should be applied as 180 kg nitrogen ha^{-1}; 4 equal split application at transplanting, 25, 45 and 60 days after transplanting (N_4) in combination with application of anilofos @ 0.40 kg *a.i.* ha^{-1} *fb* fenoxaprop-ethyl @ 80 g *a.i.* ha^{-1} at 30 days after transplanting (W_5) for better yield attributes and higher yield of transplanted hybrid rice.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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