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Influence of Different Weather Parameters and Dates of Sowings on Growth and Yield of Pre-released Rice (*Oryza sativa* L.) Cultures

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ABSTRACT

The field experiment was conducted during *kharif* season of 2019 at Agricultural Research Station, Kunaram, Telangana state, India, to study the influence of different sowing dates on growth and yield of pre released rice cultures. The experiment was laid out in split plot design with consisting of four sowing dates (June 2nd week, July 1st week, July 3rd week and August 1st week) in main plots and 4 pre released rice cultures (RNR 21278, JGL 28545, KNM 1638 and WGL 962 and 2 check varieties (KNM 118 and RNR 15048). The experimental findings revealed that the higher values of dry matter accumulation and grain yield (6839 kg ha^{-1}) were recorded with the crop sown on July 3rd week. The crop sown on August 1st week gave lowest values on number of tillers m^{-2}, number of panicles m^{-2} and grain yield (5029 kg ha^{-1}). Among all pre-released rice cultures, the culture JGL 28545 showed the higher grain yield (6734 kg ha^{-1}) which was on par with the cultures KNM 1638 (6526 kg ha^{-1}) and WGL 962 (6514 kg ha^{-1}). Among the treatment combinations, data results concluded that the rice cultures JGL 28545 and KNM 1638 recorded highest grain yield (7850.0 and 7849.0 kg ha^{-1}), when sowing was taken up on June 2nd week and July 3rd week, respectively. The linear correlation analysis with SPSS-model has been found that grain yield showed negative correlation with evaporation (-0.076) and bright sunshine hours (BSSH) (-0.372) at tillering to maturity stage (P6).

KEYWORDS: Correlation, cultures, dates, genotypes, grain yield, rice, SPSS-model

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1. INTRODUCTION

Rice (*Oryza sativa* L.) is one of the most important staple food grain crops of the world, which constitute the principal food for 60% of the world's population and 2/3 of Indian population. Total area under rice in India is 45.05 m ha with annual production of 103.27 mt, though production is large, the per hectare yield is very poor i.e., 2.29 t ha^{-1}, as compared to other rice growing countries like Egypt (6.45 t ha^{-1}), USA (5.63 t ha^{-1}), Japan (4.73 t ha^{-1}) and China (4.74 t ha^{-1}) (Wailes and Chavez, 2012). India is the world's second largest rice producer and consumer next to China. In Telangana rice is grown in 1.95 m ha with annual production of 4.46 mt and the productivity is about 3436 kg ha^{-1} (Anonymous, 2018).

Its cultivation is vulnerable to changes in temperature and rainfall. Due to global climate changes, it is essential to analyze and characterize the weather parameters like rainfall, temperature, solar radiation etc., over a region for identifying location specific sowing time. A scientific approach based on appropriate understanding of weather resources and its application for efficient crop management can help in achieving higher productivity. Various studies revealed that changes in microclimate by altering sowing dates has great role to play during vegetative and reproductive stages of the crop and also nutrient content and its uptake which ultimately affects the yield potential. Studies also showed that delayed sowing and transplanting time can significantly affect on the infestation of pest and diseases (Ahmed and Mrinal, 2021). On the other hand, seedling sown with the delay of sowing more than optimum produces fewer tillers due to the reduction of the vegetative period and hence results in poor yield. Among the crop production tools, optimum time and method of sowing are the important agronomic tools that allow the crop to complete its growth timely and successfully under specific agro-ecology zone (Vange and Obi, 2009).

Knowldge on the effect of weather variables during crops growing period on yield is essential to get maximum input efficiency and optimum grain yields from a crop. Planting too late often causes reduced yields and grain quality as the reproductive phase coincides with the height of the summer heat and rice grain yield and quality are negatively affected (Lanning et al., 2012, Wu et al., 2019). Thus, determining the optimal planting time is critical to maximize yield and grain quality. To reduce growing environment risks, the impact of climate change mitigation strategies and management systems for crop adaptation to climate change conditions should be considered (Bemal et al., 2013, Kumar et al., 2013).

In context to this genetic advance, optimum sowing time is even more relevant and non-monetary input, since varieties are comparatively more sowing time responsive. Sowing of rice during the optimum period of time resulted in high grain yield. However, optimum rice planting dates are region specific and vary with the location and varieties. Delay in sowing results in reduction of plant height, productive tillers, filled grain $panicle^{-1}$ and grain yield (Shah and Bhurer, 2005). Therefore, it is essential to investigate effect of sowing times on yield and economics of different rice genotypes under climatic condition of Northern Telangana Zone.

In upland direct seeded rice cultures; productivity is very low due to various production constraints like improper and untimely sowing, severe infestation of weeds, improper and imbalanced nutrient application, moisture stress and improper input management (Longkumer and Singh, 2009).

The present study was conducted to find out the performance of four Pre-released rice cultures with best checks under different dates of sowings with weather variables in climatic conditions of Northern Telangana Zone before recommending to the farmers.

2. MATERIALS AND METHODS

A field experiment was conducted during *kharif* season of 2019 at Agriculture Research Station, Kunaram, Telngana State, India situated at an altitude of 231 AMSL at 18.5272°' N latitude and 79.4943°f' E longitude. The soil of the experiment cites was clay in texture, slightly saline in reaction. It was normal electrical conductivity (0.31 dS m^{-1}) and neutral in reaction (pH 7.12). The organic carbon content was low (0.26–0.40%) while low in available Nitrogen (182 kg ha^{-1}), phosphorus (9.79 kg ha^{-1}) and potash content (206 kg ha^{-1}). The experiment was laid out in split plot design with three replications. A combination of 24 treatments consisting of 4 sowings dates in main plots viz. June 2nd week, July 1st week, July 3rd week and August 1st week and cultures in sub plots viz. RNR 21278, JGL 28545, KNM 1638, KNM 118, WGL 962 and RNR 15048 (Check variety). The net size of each plot was 16 m^2 (4.60×3.45 m). Row to row and plant to plant distance was made at 15 cm apart and seedlings were transplanted according to different dates of sowings. Seeds were sown at the rate of 50 kg ha^{-1} in each date of sowing in the nursery. The seeds were treated with bavistin @ 2g kg^{-1} seed before sowing. N-P-K fertilizer was used @ 150-50-40 kg ha^{-1}, respectively. 1/3 of the recommended dose of nitrogen (50 kg ha^{-1}), full dose of phosphorus (50 kg ha^{-1}) and half dose of potash (20 kg ha^{-1}) were applied at after main field preparation, and the remaining nitrogen was top-dressed in two equal splits dose, at active tillering (50 kg ha^{-1}), and at panicle initiation stage (50 kg ha^{-1}). The remaining half of the potassium (20 kg ha^{-1}) applied at panicle initiation stage in the D_1, D_2, D_3 and D_4 transplanted plots. For effective weed management, Oxadiarzyl (70 g *a.i.* ha^{-1}) was used in moist condition at morning sunshine hours in all the treatments just after D_1, D_2, D_3 and D_4 transplanted fields. Zinc sulphate (2 g l^{-1}) was sprayed to foliage at 25 and 30 DAT to avoid zinc deficiency in the crop. Irrigation was applied @ 5 cm at 7–8 days interval to maintain soil moisture at field capacity from sowing to one week before harvest during dry spells in the season. The plant height, tillers production and dry matter accumulation were recorded at tiller initiation, maximum tillering, panicle initiation, 50% flowering and maturity stage of the crop growth. Data of number of days to maximum tillering, panicle initiation, 50% flowering and maturity was recorded by visiting the field daily. The yield attributes and grain yield were recorded at harvest and sun-dried straw yield was recorded 15 days after harvest. Besides these other attributes like tiller count m^{-2} at weekly intervals, number of days to maximum tillering, panicle initiation, 50% flowering, maturity and gall midge incidence (%) at 40 days after transplanting data were collected after transplanting of different cultures with respect to D_1, D_2, D_3 and D_4 transplanted fields. Correlation coefficient relationship between yield attributes and weather variables at various phenophases and the stepwise regression to arrive at valid regression equation was carried out by using the SPSS (Statistical Package for the Social Sciences) software.

3. RESULTS AND DISCUSSION

3.1. Growth parameters

3.1.1. Plant height

At maturity stage the crop sown on July 3rd week recorded taller plant height (102.0 cm) and shortest in crop sown on June 2nd week (95.0 cm) in all the crop growth stages (Table 1). Plant height is directly proportional to the length of the vegetative phase of the crop. Increased plant height in earlier

Table 1: Effect of different sowing dates on growth and yield attributes of elite rice Cultures during *kharif*, 2019

Treatments	Plant height (cm)	Number of tillers m^{-2}	Dry matter production (g m^{-2})	Number of days to			Silver Shoots at MT (%)
				PI	50% Flowering	Days to maturity	
Main plot: Date of sowings							
June 2nd week	95.0	368.0	1027.0	84.0	88.0	116.0	6.0
July 1st week	95.0	334.0	1072.0	82.0	86.0	121.0	11.0
July 3rd week	102.0	335.0	1215.0	86.0	89.0	119.0	17.0
August 1st week	97.0	314.0	1709.0	84.0	89.0	121.0	36.0
SEm±	0.2	1.8	42.4	0.15	0.2	0.4	0.81
CD (*p*=0.05)	0.5	6.3	146.9	0.51	0.7	1.3	2.82
Sub-plot: Elite rice Cultures							
RNR 21278	89.0	335.0	1115.0	74.0	79.0	111.0	17.0
JGL 28545	98.0	402.0	1426.0	94.0	99.0	127.0	18.0
KNM 1638	98.0	318.0	1385.0	87.0	91.0	122.0	14.0
KNM 118	106.0	296.0	1097.0	80.0	84.0	116.0	20.0
WGL 962	100.0	330.0	1323.0	92.0	96.0	127.0	21.0
RNR 15048	122.0	329.0	1271.0	91.0	95.0	124.0	22.0
SEm±	0.2	6.0	35.2	0.35	0.2	0.6	1.03
CD (*p*=0.05)	0.6	17.1	100.6	1.01	0.6	1.7	2.95
Interaction (D×V)							
SEm±	0.40	11.97	70.37	0.71	0.44	1.17	2.07
CD (*p*=0.05)	1.13	34.20	201.12	2.03	1.25	3.33	5.90
Interaction (V×D)							
SEm±	0.39	11.07	76.99	0.66	0.45	1.13	2.05
CD (*p*=0.05)	1.15	31.84	234.15	1.92	1.35	3.31	6.06

planting dates was due to availability of prolonged period for vegetative growth. The interaction effect of dates of sowing and varieties on plant height was significant. The culture RNR-15048 showed maximum plant height (122.0 cm), which was significantly different from all other cultures. Increased in plant height was due to availability of prolonged period for vegetative growth to rice genotypes in these dates. These results are in accordance with the findings of (Akram et al., 2007), because of photosensitivity.

3.1.2. Number of tillers m^{-2}

Dates of sowing had significant effect on number effective tillers m^{-2} (Table 1). The maximum number of effective tillers m^{-2} (368) at maturity stage were found on June 2nd week sown crop which was significantly higher than those of July 1st week, July 3rd week and August 1st week sown crop in all the crop growth stages (Table 1). This may be due to availability of favorable soil and air temperature during growing cycle of the crop. Similarly, these results were in conformity with the results reported Deka et al. (2019). Among the rice cultures, the culture JGL 28545 registered higher number of effective tillers m^{-2} (402.0) which was significantly superior over to other cultures. It might be due to more relative growth rate and biomass production resulted in intra plant competition among the tillers for growth resources lead to more mortality of tillers when compared to short and extra short duration cultivars (Gill et al., 2006). The results are in close conformity with Dawadi and Chaudhary (2013), who also found highly significant difference in number of effective tiller $plant^{-1}$ due to variety, method of planting and their interaction.

3.1.3. Total dry matter m^{-2}

There was a significant difference in the dry matter accumulation noticed from crop sown on June 2nd week to August 1st week and a significant reduction was observed in the crop sown early on June 2nd week, July 1st week, and July 3rd week (Table 1). The maximum dry matter accumulation was in crop sown on August 1st week (1709.0 g m^{-2}) The early sown crop sometimes might have to experience to unfavorable cardinal temperature, excess rainfall, solar radiation in crop grown season resulted in lower plant height thereby accumulation of lower dry matter compared to late sown crop. Among the cultures, the culture JGL 28545 accumulated more dry matter m^{-2} (1426.0 g m^{-2}) and was on par with the culture KNM 1638 (1385.0 gm^{-2}) and significantly superior over rest of the cultures respectively. The difference in dry matter accumulation among the genotypes might be due to their genetic potential and differential plant height.

3.1.4. Gall midge incidence (%)

The data revealed that there was a significant difference was observed in different dates of sowings with respect to gall midge incidence. The lowest incidence of gall midge (6.0) was observed when crop was sown early on June 2nd week and the more incidence (36.0) was observed crop sown late on August 1st week (Table 1). Chaudhari et al. (2018) also observed that the early planting significantly reduced the incidence of gall midge followed by normal planting and highest incidence was exhibited in late planting in rice. Among the rice cultures, the low incidence of gall midge (14.0) was observed with the culture KNM 1638 which was closely followed by followed KNM 733 (17.0). These results are conformity with the Yadhav and Sastri. (2006).

3.2. Yield parameters and yield

3.2.1. Number of panicles m^{-2}

The crop sown early on June 2nd week produced maximum number of panicles m^{-2} (356.0) and it was significantly difference with the crop sown delay by 15 days interval (Table 2). Among the rice cultures, the culture JGL 28545 registered higher number of panicles m^{-2} (392.0) and were significantly superior over other rice cultures. Deka et al. (2019), also observed that panicle and spikelet numbers m^{-2} were greater with early sowing.

3.2.2. Number of filled grains $panicle^{-1}$

The crop sown early on July 1st week produced a greater number of filled grains $panicles^{-1}$ (246.0) and it was significantly difference with the crop sown early on June 2nd week and late sown by 15 days interval (Table 2). Late sowing shortened the growth period of the plant which reduced the number of grains $panicle^{-1}$ than early sown crop under aerobic culture (Bashir et al., 2010). Among rice cultures, the Culture WGL 962 was recorded significantly the highest number of filled grains $panicle^{-1}$ (292.0) and which was on par with the check variety RNR 15048 (285.0) and significantly superior to other rice cultures. The number of Spikelets $panicle^{-1}$ is basically genetic feature of a variety. These results are in close conformity with Yuan et al. (2004), who also reported that, sowing date of rice not only had effects on the grain filling parameters, but also on the difference of grain filling parameters between the two cultivars and between superior and inferior spikelets.

3.2.3. Test weight (1000 grain weight)

The data regarding the test weight (g) was affected significantly by different sowing dates and rice cultures. The crop sown on June 2nd week produced the maximum 1000 grain weight (17.6 g) followed by July 3rd (17.5 g) (Table 2). The lowest 1000 grain weight was observed when crop was sown on July 1st week and August 1st week. This showed that the environmental conditions like temperature, humidity was most favorable for grain development during early sowings as compared to other sowing dates. These

Table 2: Yield attributes and yield of elite rice cultures as influenced by different dates of sowing during *kharif*, 2019

Treatments	Number of panicles m^{-2}	Panicle length (cm)	Number of filled grains $panicle^{-1}$	Grain yield (Kg ha^{-1})	Straw yield (Kg ha^{-1})	Test weight (g)	Harvest index (%)	Net returns (₹ ha^{-1})	B:C Ratio
Main plot: Date of sowings									
June 2nd week	356.0	22.0	225.0	6067.0	5685.0	17.6	51.60	61,349.0	1.02
July 1st week	323.0	24.0	246.0	6416.0	6207.0	17.3	50.85	68,316.0	1.14
July 3rd week	330.0	24.0	211.0	6839.0	6739.0	17.5	50.38	76,788.0	1.28
August 1st week	307.0	24.0	198.0	5029.0	4979.0	15.7	50.25	40,587.0	0.68
SEm±	1.1	0.2	2.4	100.7	89.0	0.02	0.07		
CD (p=0.05)	3.8	NS	8.3	349.0	308.0	0.1	0.24		
Sub-plot: Elite rice Cultures									
RNR 21278	327.0	21.0	229.0	4848.0	4677.0	13.5	50.91	36,963.0	0.62
JGL 28545	392.0	24.0	200.0	6734.0	6494.0	15.0	50.83	74,690.0	1.24
KNM 1638	307.0	24.0	283.0	6526.0	6360.0	15.2	50.66	70,517.0	1.18
KNM 118	290.0	24.0	168.0	6243.0	6080.0	24.4	50.68	64,869.0	1.08
WGL 962	325.0	22.0	292.0	6514.0	6360.0	13.7	50.57	70,283.0	1.17
RNR 15048	325.0	26.0	285.0	6103.0	5945.0	12.9	50.62	62,058.0	1.03
SEm±	6.1	0.2	2.5	119.7	123.4	0.02	0.11		
CD (p=0.05)	17.5	0.6	7.1	342.0	353.0	0.1	NS		
Interaction (D×V)									
SEm±	12.25	0.42	4.94	239.4	242.33	0.05	0.22		
CD (p=0.05)	35.01	1.20	14.13	684.4	713.0	0.13	NS		
Interaction (V×D)									
SEm±	11.24	0.45	5.11	240.7	419.0	0.04	0.21		
CD (p=0.05)	32.18	1.35	15.29	713.4	1259.0	0.13	NS		

results are in close conformity with the Tari et al. (2007). Among the rice cultures, the culture KNM 118 recorded significantly the highest 1000 grain weight (24.4 g) and superior over the other rice cultures. These results clearly indicated that, 1000 grain weight is a varietal feature which might be affected least with the environmental conditions.

3.2.4. *Grain yield (kg ha^{-1})*

Different dates of sowings had significant effect on grain yield of rice genotypes. Significantly more grain yield (6839 kg ha^{-1}) was realized from the crop sown on July 3rd week and which was significantly superior with the crop sown on June 2nd week, July 1st week and August 1st week (Table 2). The rice crop was sown on July 1st week and July 3rd week recorded the higher grain yield it was mainly due to higher effective tillers and spikelet $panicle^{-1}$ compared to late sown on August 1st week (Table 2.). This showed that the grain yield was decreases as the sowing was done after July 3rd week. The higher yield in case of sowing on July 3rd week was attributed to increased mean value of temperature and sunshine hour due to optimum sowing, a greater number of productive tillers, a greater number of kernals $panicle^{-1}$ and increase 1000 grain weight. Among the tested rice cultures, the culture JGL 28545 produced more grain yield (6734 kg ha^{-1}) and which was on par with cultures KNM 1638 (6525 kg ha^{-1}) and WGL 962 (6514 kg ha^{-1}) and superior over to other cultures. The culture JGL 28545 was performed better due to more conversion of photosynthates into economic produce, which resulted in higher yield attributing characters in the respective varieties. Similar results were reported by Pandey et al. (2008) and Ramana et al. (2007). So, it would be better to choose short duration cultures JGL 28545, KNM 1638 and WGL 962 and follow optimum sowing dates from July 1st week to July 3rd week under climatic conditions of Northern Telangana Zone.

3.2.5. *Interaction effect*

The interaction effect among the different sowing dates and rice cultures for grain yield found to be significant (Table 3). Among the rice cultures the culture JGL 28545 was

Table 3: Interaction effect of sowing dates on grain yield (kg ha^{-1}) of different elite rice cultures

Dates of sowing	Varieties						
	RNR 21278	JGL 28545	KNM 1638	KNM 118	WGL 962	RNR 15048	Grand mean
June 2nd week	4514	7850	6062	5844	7684	7078	6067
July 1st week	5298	7212	6743	6409	7265	6345	6415
July 3rd week	5174	7089	7849	7246	7100	6708	6839
August 1st week	4407	4788	5449	5474	4008	4280	5029
Grand mean	4848.17	6734.48	6525.84	6243.46	6514.14	6102.92	
V×D Interaction		V×D Interaction					
SEm±	CD (p= 0.05)	SEm ±	CD (p= 0.05)				
239.0	684.0	240.0	713.0				

recorded highest grain yield (7850.0 kg ha^{-1}) when sowing was taken up on June 2nd week and followed by the culture KNM 1638 with sown on July 3rd week (7849.0 kg ha^{-1}).

3.3. Correlation and regression studies

In order to understand the relationship between yield parameters with different weather variables, correlation coefficients were computed (Table 4). The correlation analysis between weather variables and yield attributes of rice at different phenophases indicated that, rice yield was highly significant and positively influenced by rainfall prevailed during P1 (r=0.61) and significant and negatively influenced by bright sunshine hours prevailed during P3 (r=-0.43). Both morning (r= 0.48) and evening relative humidity (r= 0.44) was significant and positively associated with grain yield prevailed during P5. While the minimum temperature, evening relative humidity and rainfall was significant and positively associated with grain yield prevailed during P6 (r=0.47, 0.48 &0.46). Step wise regression equations between yield and weather parameters revealed that mean maximum temperature, mean minimum temperature, mean morning relative humidity, mean evening relative humidity, total rainfall, bright sunshine hours, wind speed and evaporation contributed at different phenophases to an extent of 68%, 46%, 28%, 59%, 74% and 73% respectively (Table 5). Abhilash et al. (2018) also reported that analysis of relationship of rice crop growth indices with weather parameters shows that minimum temperature was highly significant and negatively correlated with rice crop growth

Table 4: Correlation coefficients between weather parameters and rice yield during different phenophases of transplanted rice

WP	P1	P2	P3	P4	P5	P6
T_{max}	-0.095	0.384	0.148	0.115	-0.280	0.382
T_{min}	0.284	0.340	0.281	0.076	0.403	0.470*
RH I	0.243	0.317	0.196	-0.133	0.487*	0.404
RH II	0.246	0.320	0.258	0.048	0.445*	0.484*
RF	0.617**	0.209	0.234	-0.215	0.362	0.462*
BSSH	-0.229	-0.094	-0.437*	0.356	-0.209	-0.372
WS	0.216	-0.246	0.152	0.000	0.305	0.349
EV	-0.029	-0.396	-0.177	0.487*	0.156	-0.076

WP: Weather parameters; *Correlation is significant at the 0.01; **Correlation is significant at the 0.05; P1: Transplanting to maximum tillering; P2: Maximum tillering to panicle initiation; P3: Panicle initiation to heading P4: Heading to maturity; P5: Transplanting to heading; P6: Transplanting to maturity

Table 5: Step wise regression equation for rice grain yield and weather parameters during different phenophases

Sl. No.	Phase	Regression equation	R^2	Adjusted R^2
1.	P1	Y= 131702.96-2271.07 Tmax -6298.96 Tmin -62.29 RHI +1036.86 RHII +12.52 RF -259.25 BSSH +11.05WS +7256.07 EVa	0.68	0.51
2.	P2	Y=-17330.66-221.57 Tmax +1551.36 Tmin +108.50 RHI -198.40 RHII +0.118 RF +850.97 BSSH -252.84 WS -1533.61 EVa	0.46	0.17
3.	P3	Y=30043.74-573.90 Tmax +334.73 Tmin -39.80 RHI -59.90 RHII +0.230 RF -771.27 BSSH +25.75 WS +60.62 EVa	0.28	-0.96
4.	P4	Y=14085.14-2800.07 Tmax-2524.29 Tmin +376.80 RHI +1098.19 RHII -4.849 RF +2647.70 BSSH +418.47 WS +3600.86 EVa	0.59	0.37

Table 5: Continue...

Sl. No.	Phase	Regression equation	R^2	Adjusted R^2
5.	P5	Y=-191069.87+1302.58 Tmax -1292.11 Tmin +1055.93 RHI +949.60 RHII +3.51 RF +1809.94 BSSH -200.27 WS +1775.13 EVa	0.74	0.61
6.	P6	Y=-228912-1520.70 Tmax +6562.14 Tmin +824.09 RHI +37.19 RHII +4.57 RF +12538.93 BSSH +140.64 WS -9649.96 EVa	0.73	0.58

T_{max}: Maximum Temperature; T_{min}: Minimum temperature; RHI: Morning Relative Humidity; RHII: Evening Relative Humidity; F: Rain fall; BSSH: Bright Sunshine Hours; WS: Wind speed; EV_a: Evaporation

Table 6: Economic analysis of elite rice cultures affected by different treatment combinations

Treatments	Gross returns (₹ ha^{-1})	Net returns (₹ ha^{-1})	B:C Ratio
D_1V_1	90,277.0	30,277.0	0.50
D_1V_2	1,56,992.0	96,992.0	1.62
D_1V_3	1,21,243.0	61,243.0	1.02
D_1V_4	1,16,883.0	56,883.0	0.95
D_1V_5	1,53,670.0	93,670.0	1.56
D_1V_6	1,41,569.0	81,569.0	1.36
D_2V_1	1,05,965.0	45,965.0	0.77
D_2V_2	1,44,238.0	84,238.0	1.40
D_2V_3	1,34,872.0	74,872.0	1.25
D_2V_4	1,28,187.0	68,187.0	1.14
D_2V_5	1,45,301.0	85,301.0	1.42
D_2V_6	1,26,907.0	66,907.0	1.12
D_3V_1	1,03,478.0	43,478.0	0.72
D_3V_2	1,41,774.0	81,774.0	1.36
D_3V_3	1,56,973.0	96,973.0	1.62
D_3V_4	1,44,926.0	84,926.0	1.42
D_3V_5	1,42,010.0	82,010.0	1.37
D_3V_6	1,34,166.0	74,166.0	1.24
D_4V_1	88,133.0	28,133.0	0.47
D_4V_2	95,754.0	35,754.0	0.60
D_4V_3	1,08,979.0	48,979.0	0.82
D_4V_4	1,09,480.0	49,480.0	0.82
D_4V_5	80,150.0	20,150.0	0.34
D_4V_6	85,591.0	25,591.0	0.43

indices.

3.11. *Economic analysis*

The higher net returns (₹ 76,788 ha^{-1}) and B:C ratio (1.28) was recorded in July 3rd week sown crop, which was however, comparable with July 1st week sown crop (₹ 68,316 ha^{-1} and 1.14) (Table 2). Among the cultures, the culture JGL 28545 recorded higher net returns (₹ 74,690 ha^{-1}) and B:C ratio (1.24) though it comparable with the culture KNM 1638 (₹ 70,517 ha^{-1} and 1.18). Among the treatment combinations, the highest net returns (₹ 96,992 ha^{-1}) and B:C (1.62) ratio were obtained when rice crop was sown during June 2nd week with the culture JGL 28545 and followed by sown on July 3rd week with the culture KNM 1638 (Table 6). These results are close conformity with the Balaji naik et al. (2015).

4. CONCLUSION

In Northern Telangana Zone, rice cultures sown during July 1st week to July 3rd week gave the best results in terms of yield and yield components. The rice culture JGL 28545 can be recommended during June 2nd week obtained higher yield (7850 kg ha^{-1}) and economic returns followed by the genotype KNM 1638 sown during July 3rd week recorded highest grain yield (7849 kg ha^{-1}).

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