JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

THE STUDY ON THE EFFECT OF DIFFERENT TYPE OF BLADES/TYNE AND THEIR COMBINATION ON YIELD AND OTHER ASSOCIATED CHARECTERISTICS OF RICE CROP USING RIDING TYPE POWER TILLER

KUMAR SHAILENDRA[1], SINGH NEELAM KUMAR[2]

1. *Assistant Professor, Department of Agricultural Engineering, BNPG College, Rath, Hamirpur, Uttar Pradesh, India.*
2. *Associate Professor, Department of Agricultural Statistics, BNPG College, Rath, Hamirpur, Uttar Pradesh, India.*

Abstract: In the present study, five treatments *i.e.* C, L, T, and C+T, L+T were experimented to test their effect on rice crop. The yield, plant emergence, tiller count and plant height during two successive years 2009-10, 2010-11of rice crop at I.G.K.V. Raipur, Chhattisgarh, India using R.B.D. on the said site was experimented and studied. It is found that above treatment combinations having significant difference among themselves for characters, yield, plant emergence, tiller count and plant height. The combinations L+T are found to be the best combination for aforesaid rice crop characteristics. The average of treatments was compared from CD and has been found to differ significantly. Therefore, L+T type combination should be advised in national planning and recommended for small and marginal farmers adopting power tillers for rice crop.

KEYWORDS: POWER TILLER, RBD, TYPE OF BLADES/TYNES AND THEIR COMBINATION, TILLING PRACTCES

Introduction: Most of cultivation pattern of India from ancient period to modern period was dependent on the animal energy such as bullock, he-buffalo along with energy of the man-kind etc. and was integrative part of farming such as animal husbandry (Kumar Shailendra and Singh Neelam Kumar, 2019). Presently, India has been transformed with high technological innovation in farming pattern resulting in to high fuel consumption. Because, high initial cost of tractors and their operational cost, it is imperative that small and marginal farmers could prefer power tillers as a important substitute to optimize fuel consumption, along with operational cost so as to increase the crop production which is more economical and viable for small and marginal farmers.

Power tillers carry low weight than tractors. It is also known that because of heavy weighted tractors with their implements, there is found to be high degree of soil compaction resulting to hard layer in the soil which leads to water logging hindering proper seed germination affecting the gross production. It also affects tillers in the crops.

Power tillers are specially designed and developed for use by small and medium farmers and in farming situations where four wheel tractors are either difficult or uneconomical to use. Power tiller is more suitable than heavy tractors in rice zone and wet land farming. The Government is trying to boost the sale by providing huge subsidy on the power tillers. Presently, in Chhattisgarh about eighty thousand per power tiller subsidy is being provided by the government. The tilth quality and tillage performance of the power tiller depends on types and shape of blade (Shailendra Kumar, 2013). Which type of blade and its combination with or without tractive tine performs better under local conditions need to be studied to guide the farmers, power tiller suppliers and policy makers for economical and eco-friendly technological innovation for economic development of small and marginal farmers so as to carry the agriculture system with optimal consumption of fuel (Kumar S. *et. al.*, 2014)..

The conventional tillage created a satisfactory medium for plant growth, but on the other hand it destroyed the soil structure, increased the compaction, and reduced the infiltration rate and organic matter. Minimum tillage reduced the soil

compaction to conventional tillage whereas the crop yield remained at par in plots under minimum tillage treatments when compared with that of conventional treatments (Edminister and Miller, 1959).

Saxena *et al.* (1979) reported that wheat yield and yield attributes viz ear length, grain/ear, grain weight/ear, and 1000 grain weight were significantly higher under minimum tillage than those obtained under conventional tillage.

Ellis and Howse (1980) reported that direct drilling resulted in increased concentration of P and K within the surface 0-5 cm of soil compared with mould ploughing.

Sial *et al.* (1981) conducted that draft requirements of sweep cultivator and narrow tine cultivator were equal. Approach angle, overlap and zone of soil disturbance were found suitable parameters which contribute to reducing drafts of the sweep cultivator.

Sharma *et al.* (1984) compared the effect of no-tillage system with conventional tillage and stated that there was no significant difference between the average yields. Energy requirement and cost of cultivation was high in conventional system. No- tillage system required the least energy and cost of production while these requirements were about 1.5 times higher in conventional system.

Varshney *et al.* (1991) developed a power tiller drawn seed-cum fertilizer drill consisting of the main frame, seed and fertilizer box, fluted roller type metering mechanism, ground-wheel, furrow opener, depth adjustment mechanism, hitch etc. It was tested for its performance for sowing wheat, Bengal gram, soya bran, sorghum and pigeon pea crops and was compared with CIAE 3-row animal drawn seed cum fertilizer drill under statistically designed experiments. The data indicated that the field capacity of the power tiller drawn seed drill was about 55% higher for wheat and 24% higher for Bengal gram than that of animal drawn seed drill. This was due to greater number of rows covered by the power tiller drawn seed cum fertilizer drill. The plant population was high in power tiller drawn seed drill for all the crops due to skidding of ground wheel of animal drawn seed drill, which affected the seed rate

Varshney *et al.* (1991) conducted experiment during the year 1995-96 and 1996-97. In the first year, experiment was conducted on different field conditions (undisturbed, chopped, burnt and tilled) with five types of furrow openers (inverted-T with coulter, inverted-T, single disc, double disc and inverted-T with row cleaning disc). In the second year, experiment was conducted where four field conditions as stated above with two type of furrow opener, *i.e.* inverted-T with coulter and inverted-T alone. He reported that the grain yields were significantly higher with inverted-T type furrow opener with coulter during both the years with average yields of 3932 kg ha-1 and 4860 kg ha-1 in years 1995-96 and 1996-97 respectively. The crop yields with furrow opener having inverted-T and inverted-T with coulter were at par during both the years under burnt and tilled condition. He further reported that inverted-T furrow opener with coulter performed satisfactory in field conditions.

Material and Methods

Therefore, it is imperative to see the effect of types of blades on power tiller shaft with and without their combinations for rice–wheat cropping system in Chhattisgarh plains and agro-climatic conditions. Further, design of power tiller mounted till drill machine and to operate with the existing roto-tiller proper arrangement were made. The machine was developed with the riding type SHRACHI power tiller. The machine was designed using CAD software and was fabricated in workshop of the Faculty of Agricultural Engineering, IGKV, Raipur. Basically, two types of rotary blades (C&L) for power tiller are available in the market. Their effect on tilth quality, crop yield, was needed to be observed. Therefore, suitable arrangement in the machine was made to operate the tillers with different type of blades and with and without tractive tines. The developed machine consisted a seed cum fertilizer box; four fluted feed rollers, four rigid tines mounted on toolbar with reversible shovels, ground wheel and adjusting devices. The field experiment was carried out during *Kharif* seasons in the years 2009 and 2010 at the research farm of Faculty of Agricultural Engineering, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh (CG) on conservation tillage equipments under rice-wheat cropping system for cultivation of paddy. Five treatments *i.e.* C, L, T and C+T, L+T were experimented to test their effect on rice crop. An area of 1 sq.m was selected and the numbers of plants in that area were counted for each crop. The plant's tillers and plant height were counted in different places for 1 sq.m and the average values were taken. The grain yield data was obtained by harvesting the crop manually from one m^2 areas which were earmarked for data collection in the test field. The crop was threshed and cleaned manually, and the grain so obtained was weighed to determine the crop yield. Total five replications were taken from treatment to work out the average grain yield on per hectare basis expressed in kg ha^{-1}. The yield, plant emergence, tiller count and plant height during two successive years 2009, 2010 of rice crop at I.G.K.V. Raipur, Chhattisgarh, India using R.B.D. on the said site was experimented and data was analyzed and conclusions were drawn using ANOVA table.

Results and Discussions: Result Results are discussed under following heads.

Effect of blades on rice plant emergence

The effect of shape of blades on rice plant emergence during year 2009-10 and 2010-11 are shown in Tables 1 and 2 respectively. It is revealed from Tables 1 and 2 that the maximum plant emergence (20.19, 20.17) was found with L shape blade for both the years during 2009-10 and 2010-11 respectively. The values indicate that the emergence of plants were statistically at par during both the years. However, the plot prepared with L shape of rotary blades gave about 1% higher plant emergence over other type of blades/tine. This may be due to comparatively shallow and weed free tilth with "L" shape of blades.

Effect of blades on rice plant height

To determine the effect of treatments on the plant height under different treatments were observed at 15 DAS and at harvesting stage during 2009 and 2010. The mean of mean values are shown in Tables 1 and 2. No significant difference is found

in plant height at 15 DAS during the both years however at harvesting stage longer plant height were observed with L shape (105.52 cm, 105.96 cm) which is about 2.5% and 1.49% more over other type of blades (Tables 1 and 2) respectively.

Effect of blades on tiller count

The tillers of rice crop were observed at harvesting and given in Tables 1 and 2 for years 2009 and 2010 respectively. Maximum tillers were found with rotary blade L, (348.33 and 352.33 nos. / m^2) followed by C, (346.33 and 345.33 nos./m^2) during I and II year respectively as shown in Tables 1 and 2, which were significant higher ($CD_{5\%}$ = 6.76) during year 2010 however, statistically at par during 2009. The reason for higher tillering with "L" shape blade may be due to comparatively weed free condition and minimum MMD.

Effect of blades on rice grain yield

Effect of shape of rotary blades on rice yield is shown in Table 1 and 2 for year 2009 and 2010 respectively. It is revealed from both the table, that the maximum yield was observed with L shape (5796 kg/ha and 5864 kg/ha) during 2009 and 2010, which was followed by C (5758 kg/ha and 5739kg/ha) blade. However, it was found statistically at par during both the years. Minimum yield was found with tractive tines, T (5714, and 5736 kg/ ha) during both the years. The L shape rotary blade alone gave about 1.44% and 2.2% higher yield during years 2009 and 2010 respectively over other two types. It may be due to weed free and better pulverization with L shape which might have provided favorable condition for better crop establishment.

Table 1 Effect of shape of rotary blades, tractive tines and level of passes on rice crop establishment, grain yield

(Fig. shows mean values of three replications of year 2009)

Treatments Blades/ tines	**Pl. emer. nos./m row**	**Pl. ht. 15 das, cm**	**Pl. ht. at har. cm**	**Tiller popn nos./m^2**	**Rice yield, kg/ha**
1.Rotary "C"	19.92	14.50	102.89	346.33	5758
2.Rotary "L"	20.19	15.13	105.52	348.33	5796
3.Tra, "T" Tyne	20.04	15.03	105.17	343.44	5714
4. "C+T"	20.38	17.50	105.44	358.33	5956
5. "L+ T"	20.87	18.33	106.86	367.67	6111
6.Untilled	19.13	14.77	101.67	307.33	5100
CD 5%	0.29	1.64	3.50	5.68	99.00
Level of passes					
P_1 : 1-pass	20.06	15.03	104.05	340.94	5669
P_2 :2- pass	20.07	17.08	104.42	345.39	5741
P_3 :3-pass	20.11	15.00	105.31	349.39	5808
CD 5%	0.30	1.65	3.48	5.67	99.00

Effect of Combination of Rotary and Tractive Type Tines

The effect of combination of rotary blades and tractive type tines on grain yield for rice cropping pattern during years 2009 and 2010 was observed. The method has been described. The power tiller was operated with both the tillage tools rotary and tractive type blades separately and in their combinations as shown in the Tables 1 and Table 2 on crop establishment, yield.

Effect of blades combinations on rice plant emergence

The effect of combinations of rotary blades/ tractive tine, C+T and L+T on rice plant emergence during years 2009 and 2010 are shown in Tables 1 and 2 respectively. The values were indicated that the higher emergence of plants was observed with combination L+T (20.87 and 22.29 nos. /m) followed by C+T (20.38 and 21.11 nos. /m) and found statistically significant at 5% level of significance during both the years ($CD_{5\%}$ = 0.29 and 0.78).

Table 2 Effect of shape of rotary blades, tractive tines and level of passes on rice crop establishment, grain yield

(Fig. shows mean values of three replications of year 2010)

Treatments Blades/ tine	Pl. Emer. Nos./m row	Pl. ht. 15 das, cm	Pl. ht. at har. cm	Tiller popn nos. /m^2	Grain yield, kg/ha
1.Rotary "C"	20.86	15.11	104.41	345.33	5739
2.Rotary "L"	20.17	15.26	105.96	352.33	5864
3.Tra, "T" Tyne	21.01	15.05	105.46	342.44	5736
4. "C+T"	21.11	15.09	106.41	366.00	6078
5. "L+ T"	22.29	15.42	107.12	378.33	6296
6.Untilled	19.73	15.37	101.67	323.67	5393
CD 5%	0.78	1.10	105.17	6.76	133
P_1 : 1-pass	20.27	14.98	104.18	345.56	5785
Level of passes					
P_2 :2- pass	21.10	15.52	105.44	352.96	5900
P_3 :3-pass	20.78	15.15	105.89	355.56	5952
CD 5%	0.79	1.08	1.41	6.78	134

Effect of blades combination on rice tiller count

Effect of combinations on the tillers of rice crop were observed at harvesting and given in Tables 1and 2 for years 2009 and 2010 respectively. Among the combinations, more tillers were found with combination L + T (367.67 and 378.33 nos. /m^2) followed by C+T (358.33 and 366.00 nos. /m^2) during I and II years as shown in Tables 1 and 2 respectively, which was found significantly higher for both the years ($CD_{5\%}$ = 5.68, 6.76). The reason for higher tillering with L+T may be due to comparatively weed free condition and minimum MMD.

Effect of blades combination on rice grain yield

The effect of shape of rotary blades combination with tractive tine T on rice yield is shown in Tables 1 and 2 for years 2009 and 2010 respectively. It is revealed from both the tables, that the maximum yield was found with L+T shape (6111 kg/ha and 6296 kg/ha) followed by C+T (5956 and 6038 which was more during both the years and statistically significant at 5% level of significance. It may be due to weed free and better pulverization with L+T shape which might have provided favorable condition for better crop establishment.

Conclusions: After scientific experimentation, it has been found that L + T type combination is found to be the best combination for maximum and out of characteristics such as yield, plant tillers plant height and plant emergence. Therefore, L + T type combination should be recommended and advised for small farmers using power tillers. The same findings can be mirror for National Technological innovation and policy for optimal production of rice in the country at optimal cost.

Paddy (Mtu-1010) Yield (Q/Ha), Under Different Treatments And Level Of Passes During 2009

ANOVA

SV	DF	SS	MSS	Fcal	Ftab	$T_{5\%}$	Result
Repli	2	5.79	2.89	11.85			Signi
Treat	5	179.35	35.87	146.79	3.33	2.23	Signi
Error	10	2.44	0.24				
Total	17						
CD	0.90		CV	0.86			

Paddy (MTU-1010) Yield (Q/Ha), Under Different Treatments And Level Of Passes During 2010

ANOVA

SV	DF	SS	MSS	Fcal	Ftab	$T_{5\%}$	Result
Repli	2.00	14.16	7.08	14.35			Signi
Treat	5.00	140.50	28.10	56.99	3.33	2.23	Signi
Error	10.00	4.93	0.49				
Total	17.00						
CD	1.28		CV	1.20			

Effect of blade shape and their combination on plant emergence no./m of paddy (mtu-1010), 2009
Treatments Level of passes

ANOVA

SV	DF	SS	MSS	Fcal	Ftab	$T_{5\%}$	Result
Repli	2	0.01	0.00	0.17			Non Signi
Treat	5	4.90	0.98	37.70	3.33	2.23	Signi
Error	10	0.26	0.03				
Total	17						
CD	0.29		CV	0.80			

Effect Of Blade Shape And Their Combination On Plant Emergence No/m of Paddy (MTU-1010), 2010

ANOVA

SV	DF	SS	MSS	Fcal	Ftab	$T_{5\%}$	Result
Repli	2	0.55	0.28	1.53			Non Signi
Treat	5	11.65	2.33	12.83	3.33	2.23	Signi
Error	10	1.82	0.18				
Total	17						
CD	0.78		CV	2.04			

Paddy (MTU-1010) Plant Height**, (cm)** 15DAS **Under Different Treatments And Level Of Passes During 2009**

ANOVA

SV	DF	SS	MSS	Fcal	Ftab	$T_{5\%}$	Result
Repli	2	13.71	6.86	8.48			Signi
Treat	5	38.91	7.78	9.63	3.33	2.23	Signi
Error	10	8.08	0.81				
Total	17						
CD	1.64		CV	5.66			

Effect Of Blade Shape And Their Combination On Plant Height Of Paddy (Mtu-1010), Cm, 15- Das During 2010

ANOVA

SV	DF	SS	MSS	Fcal	Ftab	$T_{5\%}$	Result
Repli	2	0.93	0.46	1.32			Non Signi
Treat	5	0.36	0.07	0.21	3.33	2.23	Signi
Error	10	3.51	0.35				
Total	17						
CD	1.08		CV	3.89			

Effect of blade shape and their combination on plant height of paddy at harvesting (mtu-1010), cm 2009.

ANOVA

SV	DF	SS	MSS	Fcal	Ftab	$T_{5\%}$	Result
Repli	2	5.02	2.51	3.04			Non Signi
Treat	5	55.48	11.10	13.45	3.33	2.23	Signi
Error	10	8.25	0.82				
Total	17						
CD	1.65		CV	0.87			

Effect of blade shape and their combination on plant height, cm at harvesting of paddy (mtu-1010), 2010.

ANOVA

SV	DF	SS	MSS	Fcal	Ftab	$T_{5\%}$	Result
Repli	2	9.45	4.73	7.87			Signi
Treat	5	56.60	11.32	18.86	3.33	2.23	Signi
Error	10	6.00	0.60				
Total	17						
CD	1.41		CV	0.74			

Bibliography

Brahma Prakash. 1997. Investigation into the effect of various types of furrow openers on no-till drill under residue conditions. *Unpublished Ph.D. Thesis.* Deptt. of Farm Machinery and Power Engg. G.B. Pant University of Agriculture and Technology, Pantnagar, p. 226.

Ellis, B. Frank and Howse, R. Kenneth. 1980. Effect of cultivation on the distribution of nutrient in the soil and the uptake of the Nitrogen and Phosphorus by spring barley and winter wheat on three soil types. *Soil and till. Res.*1: 35-46.

Edminister, Y. W. and Miller, H. F. (Jr.), 1959. Recent Developments in Agricultural Machinery. *Advanced Agronomy*.11:171-232.

Kumar Shailendra, (2013). Design, Development and Studies on Power Tiller Operated Conservation Tillage-Seeding Machinery System. Ph.D. *Unpublished Thesis.* FAE, IGKV, Raipur.

(Kumar S. *et al*., 2014). Design and Development of a Power Tiller Operated Seed-cum-ferti till-drill Machine. *African journal of Agricultural Research,* Vol.9 (51), pp. 3776-3781.

Kumar Shailendra and Singh Neelam Kumar (2019). A Study on the Effect of Different Types of Blades / Tine on Wheat Production Using Riding Type Power Tiller. *International Journal of Agricultural Science and Research (IJASR),* Vol. 9, Issue 4, Aug 2019, 21-26.

Saxena, R.K., Singh, B.P. and Singh, P.N. 1979. Response of wheat to minimum tillage. *Indian Journal of Agronomy,* 21 (2): 165-166.

Sharma, D. N., M. L. Jain, and Sharma, 1984. Evaluation of no–tillage and conventional tillage systems. *Agricultural Mechanization in Asia, Africa and Latin America*, 15: p14-19.

Sial, J. K., Sheikh, G. S., Afjal, M. 1981. Development and comparative performance of a cultivator with sweap shovels. *AMA, SPRING*, 39-42.

Varshney, A. C. *Bohara, C. P. and Narang, S. 1991*. *Design, Development and Evolution of Power Tiller*-Drawn Seed-Cum-Fertilizer Drill. *AMA*, 22(1):39-41.