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Effect of date of transplanting of rice on the incidence of leaf folder (*Cnaphalocrocis medinalis* Guenee) in Ranchi, Jharkhand

***A. KUMARI AND R. PRASAD**

Department of Entomology, Birsa Agricultural University, Kanke, Ranchi, Jharkhand-834006

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ABSTRACT

The present field experiment was conducted during kharif 2019 and 2020 with an objective to study the effect of transplanting dates on incidence of leaf folder (Cnaphalocrocis medinalis G.) in rice variety Naveen. The data on leaf folder incidence was recorded in all two seasons trials, the experiments comprised of three dates of transplanting i.e. 1st July, 20th July and 9th August in trial plots in Randomized Block Design and it replicated ten times. It was evident from the data that significant differences occurred among transplanting dates pertaining to percentage of leaf damage due to leaf folder. Rice crop transplanted late; 9th August was heavily infested by leaf folders (15.69 %) and minimum infestation by leaf folders was recorded (7.30 %) in early transplanted crop i. e.1st July.There was maximum yield of rice grain in early (46.76 q ha^{-1}) followed by normal (43.64 q ha^{-1}) and late (36.13 q ha^{-1}) transplanted rice. In brief, earlier was the date of planting lesser was the pressure of attack of pest complex and higher was the realization of grain yield.So, early transplanting can be the one of best cultural practices to reduce the incidence of leaf folder.

Keywords: *Cnaphalocrocis medinalis*, leaf damage, leaf folder incidence, planting dates, and rice

Rice botanically known as *Oryza sativa* L., belongs to the Poaceae family (Previously Graminae), under subfamily Oryzoidea and tribe *Oryzeae* and origin – Indo-Burma Region. *Oryza sativa* is distributed all over the world with a high concentration in Asia. It is the major staple food in Asian countries as well as in India and Jharkhand. More than 100 insect pest species are known to attack the rice crop and 20 of these are economically more important. Out of 20 insect pest species, half a dozen of major insect pest of rice is prevailing in the state of Jharkhand like, stem borer, gall midge, brown plant hopper and leaf folder. Yield loss in rice due to these insect pests in Jharkhand varies from 15-65% depending upon the intensities of the attack of the pest species (Prasad *et al*., 2018). Among these Insect-pests, leaf folder *Cnaphalocrocis medinalis* Guenee (Lepidoptera: Pyralidae), is of major importance, because of its ability to remove the chlorophyll content of the leaves resulting in the considerable reduction in yield.The rice leaf folder is a predominant foliage feeder and one of the most destructive pests affecting in all the rice ecosystems in Asia. The yield losses due to leaf folder in rice is 30 to 80 per cent under epidemic condition (Raveeshkumar, 2015). Under ecological studies, effect of different dates of planting on the incidence of insect pests trial was conducted with an objective to know the effect of date of transplanting on leaf folder incidence. Magumnder *et al*., (2013) found that early planted rice crop had lower pest and natural enemies than later transplanted rice (after 30th August). Early transplanting was beneficial for reduction of damage caused by leaf folder. Prasad (2020) revealed that the crop transplanted early (1st July), normal date of planting (15th July), delayed planting (30th July) and very delayed planting crop (14th August), yielded 44.46, 39.85, 34.64 and 29.20 q ha^{-1}during, 2015 and 46.90, 40.90, 35.75 and 30.80 q ha^{-1}during 2016, respectively.

MATERIALS AND METHODS

This field experiment was conducted to study the effect of three different dates of planting at rice research farm (BAU), Ranchi. Most popular rice variety Naveen was planted at three different dates viz., normal planting as per the recommended package and practices of rice, 20 days earlier to normal planting, designated as 'early planting' and 20 days later than the normal planting, designated as 'late planting'. Each time, sowing of the nursery and planting was done separately. That means there were three treatments i.e., date of transplanting @ 20 days intervals (Table 1).

Table1 Schedule of date of sowing and transplanting of the treatments

DATES OF SOWING (D/S)	DATES OF TRANSPLANTING (D/T)
1) 10th June of the year(s)	1st July of the year (s)
2) 1st July of the year (s)	20th July of the year (s)
3) 20nd July of the year (s)	09th August of the year (s)

Email: alka.aiims@gmail.com

This field experiment was conducted in a randomized block design with three treatments as early, normal and late sowing rice variety and 10 replications, during *kharif* season of 2019 and 2020. (Each plot size was 15× 3 (45 meter square). Plant spacing was 20 × 15 cm i. e. 20 cm spacing between lines and 15 cm spacing between hills were maintained. (The size of each plot was 5 x 4 m^2 (Twenty meter square). Intercultural operations like weeding, irrigation and other activities were carried out as and when necessary for sustainable production. The recommended dose of fertilizer (N:P:K) i.e. 80:40:20 Kg ha^{-1} was applied to the crop in two splits i.e. 50 % N, full dose of P_2O_5 and K_2O during final land preparation and remaining 50% N(in two spilt dose 25% each) at the tillering stage and at time of panicle initiation. No chemical insecticides were used for allowing the pest and natural enemies to multiply. In each plot, 10 random plants were selected and recorded damage plants and healthy plants as well as damaged leaves and total number of leaves due to attack of leaf folder.The observations on the leaf damage caused by leaf folder (LDLF %) were recorded at 50, 70 and 80 DAT (days after transplanting) during both the years of experiment *viz*. *kharif* season of 2019 and 2020**.** Pooled mean of these two years data recorded at 50, 70 and 80 DAT were calculated separately and overall mean of each year and their pooled mean were also calculated for computation of final experimental findings. LDLF per cent were calculated by using following formula:

$$\text{LDLF } (\%) = \frac{\text{Total no. of damaged leaves / 10 hills}}{\text{Total no. of leaves (damaged + healthy) / 10 hills}} \times 100$$

Statistical analysis

Percentage experimental data i.e. LDLF % was converted into angular values (i.e. through arc sin tables) for their statistical analysis for proper interpretation and documentation.

RESULTS AND DISCUSSION

A careful scrutiny of the results (as shown in Table-2 and Fig.1) indicated that during both the years of experiments incidence of LDLF was increased from 50 to 80 DAT. There was significant difference at 50 and 80 DAT among different dates of planting with minimum LDLF per cent in early followed by normal and late transplanted rice in both the years of experiments and their pooled mean also followed same pattern.

At 50 DAT

During both the years (2019 and 2020) at 50 DAT, incidence of LDLF was minimum in early (4.60 and 5.20 %) followed by normal (8.24 and 9.18 %) and late (12.40 and 13.59 %) transplanted rice, respectively. Pooled mean of these two years data followed similar pattern as during both the years with 4.90, 8.71 and 13.00 per cent LDLF was recorded in early, normal and late transplanted rice, respectively.

At 70 DAT

At 70 DAT, leaf folder damage in term of LDLF per cent was minimum in early (6.78 and 7.08 %) followed by normal (11.99 and 12.33 %) and late (15.05 and15.60 %) transplanted rice, during both the *kharif* seasons 2019 and 2020 respectively.Pooled mean of these two year's data followed similar trend as during both the years it was recorded with 6.93, 12.16 and 15.32 per cent LDLF in early, normal and late transplanted rice, respectively.

At 80 DAT

Minimum incidence of LDLF was in early (9.80 and 10.33 %) followed by normal (13.59 and 15.49 %) and late (18.45 and 19.05 %) transplanted rice, during both the years (2019 and 2020) at 80 DAT, respectively. Pooled mean of these two years followed similar pattern as during both the years with 10.07, 14.54 and 18.75 per cent LDLF was recorded in early, normal and late transplanted rice, respectively.

Overall mean of 50, 70 and 80 DAT

In the year 2019 and 2020 overall mean of incidence of LDLF was (7.06 and 7.54 %), (11.27 and 12.33 %) and (15.30 and 16.08 %) in early, normal and late transplanted rice, respectively. Pooled mean of these two years data followed similar pattern as during both the years with 7.30, 11.80 and 15.69 per cent LDLF was recorded in early, normal and late transplanted rice, respectively. The outcome of the present investigation showed that low incidence of leaf folder in rice was exhibited in early transplanted crop i.e. (1st July). Similar finding of low incidence of rice leaf folder in early transplanted crop was reported by Maniperunal (1989). Chander and Singh (2001) and Yadav (2018) also agreed with this experimental finding who reported that early planting minimized incidences of leaf folders because alternation in planting time create asynchrony between pest and host. Singh *et al.* (2013) revealed that the maximum damage of leaf folder was observed in very late transplanting and least damage in early transplanting in both the experimental years.

Table 2 : Impact of different dates of transplanting on the incidence of leaf folder (*Cnaphalocrocis medinalis* Guenee) infesting rice var. Naveen

Date of transplanting	LDLF%											
	50 DAT			70 DAT			80 DAT			Overall Mean		
	2019	2020	Pooled Mean	2019	2020	Pooled Mean	2019	2020	Pooled Mean	2019	2020	Pooled Mean
D_1 : Early transplanting (01.07. 2019 & 01.07.2020)	5.20 (13.12)	4.60 (12.32)	4.90 (12.72)	6.78 (15.03)	7.08 (15.39)	6.93 (15.21)	9.80 (18.12)	10.33 (18.69)	10.07 (18.41)	7.06 (15.37)	7.54 (15.90)	7.30 (15.63)
D_2 : Normal transplanting (20.07.2019 & 20.07.2020)	8.24 (16.56)	9.18 (17.56)	8.71 (17.06)	11.99 (20.17)	12.33 (20.46)	12.16 (20.31)	13.59 (21.57)	15.49 (23.14)	14.54 (22.36)	11.27 (19.57)	12.33 (20.53)	11.80 (20.05)
D_3 : Delayed transplanting (09.08.2019 & 10.08.2020)	12.40 (20.60)	13.59 (21.59)	13.00 (21.09)	15.05 (22.74)	15.60 (23.17)	15.32 (22.96)	18.45 (25.41)	19.05 (25.84)	18.75 (25.62)	15.30 (23.00)	16.08 (23.61)	15.69 (23.31)
SEm(±)	**(0.47)**	**(0.46)**	**(0.33)**	**(0.50)**	**(0.50)**	**(0.35)**	**(0.55)**	**(0.59)**	**(0.40)**	**(0.37)**	**(0.41)**	**(0.28)**
LSD (0.05)	**(1.39)**	**(1.37)**	**(0.94)**	**(1.49)**	**(1.49)**	**(1.02)**	**(1.63)**	**(1.76)**	**(1.16)**	**(1.09)**	**(1.23)**	**(0.79)**
CV (%)	**(8.94)**	**(8.35)**	**(8.64)**	**(8.22)**	**(8.05)**	**(8.13)**	**(8.01)**	**(8.29)**	**(8.16)**	**(6.01)**	**(6.54)**	**(6.29)**

Figures in parentheses are angular transformed values LDLF: Leaf damaged by leaf folder, DAT: Days after transplanting

Impact of different dates of transplanting on grain yield of rice

A close perusal of the results (Table 3 and Fig. 2) indicated that there was significant impact of three dates of transplanting on grain yield of rice. In the years 2019 and 2020, yield of grains (q ha^{-1}) were found to be 45.18 and 48.34, 41.46 and 45.73 and 34.98 and 37.29 in early, normal and late transplanted rice, respectively. Pooled mean of the yield indicated that there was maximum yield of rice grains in early (46.76 q ha^{-1}) followed by normal (43.64 q ha^{-1}) and late (36.13 q ha^{-1}) transplanted rice in the present studies.

Similar results were also found by Hugar *et al*. (2014) who revealed that the rice planted on 30th May and 15th June had grain yield to the tune of 48.55 and 46.48 q ha^{-1}, respectively, whereas, in case of 30th July and 15thAugust planted crop, yield was as low as 18.92 and 15.93 q ha^{-1}, respectively. The experiments obtained by Anonymous (2019, 2020) were also in agreement with the present findings but on the other side, experimental findings of Bashir *et al*. (2010) stated that normal sown (20 June) crop had higher grain yield than both early (31st May and 10th June) and late sown (30th June, 10th July and 20th July) and varied from the present experimental findings. This might be happened due to certain changes in the agro-climatic conditions.

Based on overall mean results of two year experimentation (2019, 2020), it was found that the incidence of leaf folder was 7.30, 11.80 and 15.69 per cent LDLF in early, normal and late transplanted rice, respectively. There was maximum yield of rice grain in early (46.76 q ha^{-1}) followed by normal (43.64 q ha^{-1}) and late (36.13 q ha^{-1}) transplanted rice. In brief, earlier was the date of planting lesser was the pressure of attack of pest complex and higher was the realization of grain yield. Twenty days early transplanting (1st week of July) of rice could be able to reduce the incidence of LDLH. In other words, earlier was the dates of transplanting, lesser was the incidence of leaf folder.There was maximum yield of rice grain in early (46.76 q ha^{-1}) followed by normal (43.64 q ha^{-1}) and late (36.13 q ha^{-1}) transplanted rice.

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Table 3: Impact of different dates of transplanting on the yield of rice (var. Naveen)

Date of transplanting	Yield recorded (q ha^{-1})		
	2019	**2020**	**Pooled mean**
D_1: Early transplanting(01.07. 2019 & 01.07.2020)	45.18	48.34	46.76
D_2: Normal transplanting(20.07.2019 & 20.07.2020)	41.56	45.73	43.64
D_3: Delayed transplanting(09.08.2019 & 10.08.2020)	34.98	37.29	36.13
SEm(±)	**1.19**	**1.66**	**1.02**
LSD (0.05)	**3.54**	**4.94**	**2.94**
CV (%)	**9.29**	**12.02**	**10.85**

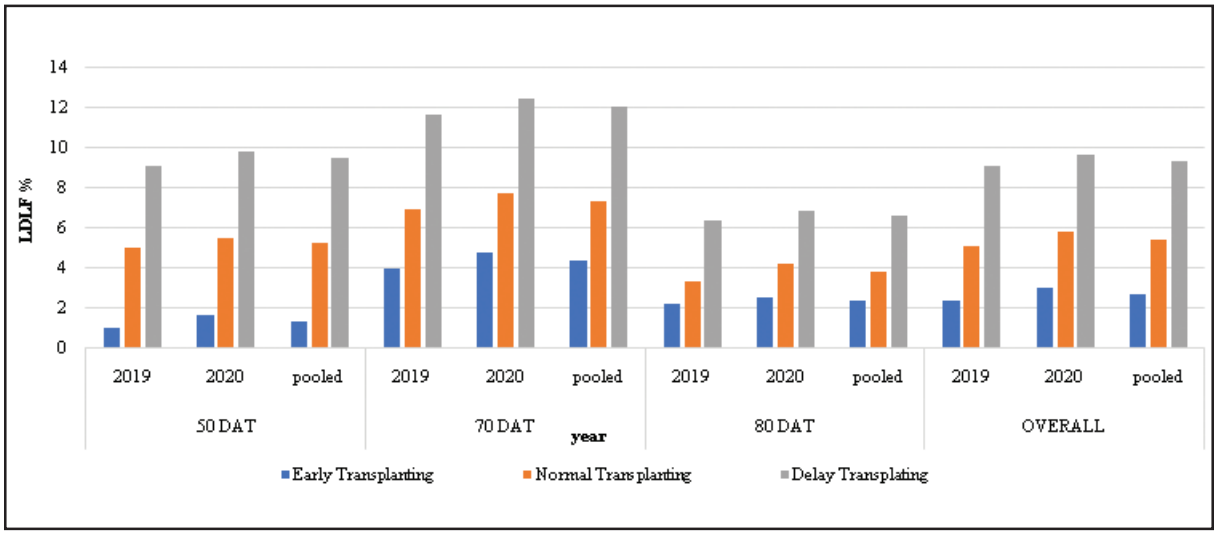

Fig. 1 : Impact of date of transplating of rice variety Naveen on the incidence of leaf folder

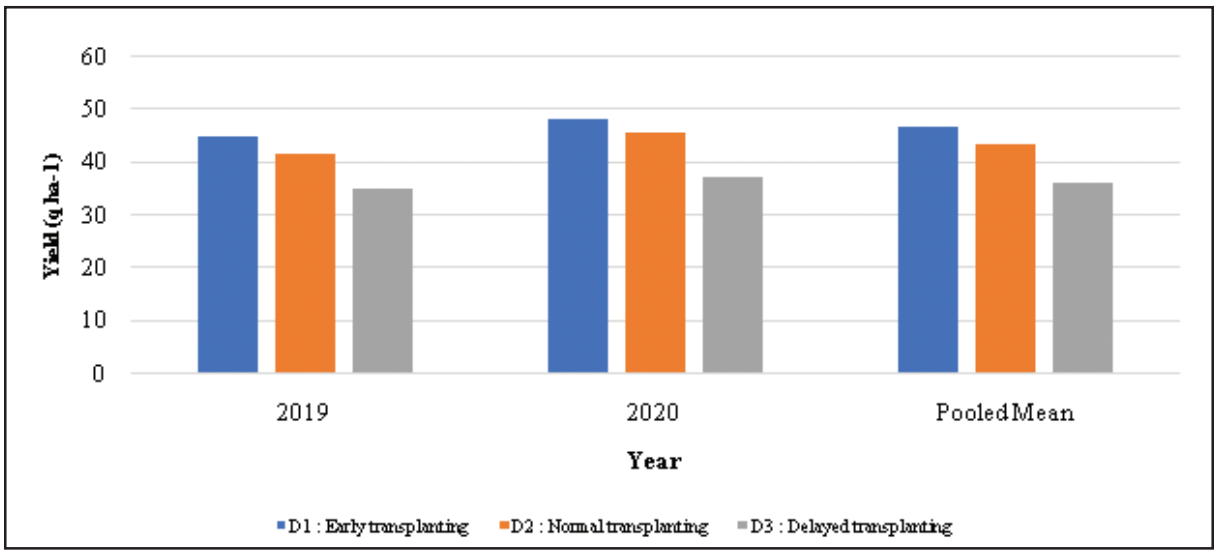

Fig. 2 : Impact of different dates of transplanting on grain yield of rice (var. Naveen)

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