Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(5): 2023-2027

Received: 01-07-2017
Accepted: 02-08-2017

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Crop establishment impact on foliage feeders and *Leptocorisa acuta* in rice

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Abstract
The study was conducted in direct seeded and transplanted rice at at Chaudhary Charan Singh Haryana Agricultural University, Rice Research Station, Kaul during 2014 and 2015 with objective to study the effect of crop establishment methods on incidence of insect pest. The pooled data on incidence of foliage feeders revealed less than one per cent damage in direct seeding and transplanting rice throughout the season during both the years and did not differ significantly. The population of Rice gundhi bug, *Leptocorisa acuta* varied from 0.08 to 0.16/ hill in direct seeding and 0.10 to 0.12/ hill in transplanted in different weeks during 2014. The population count ranged from 0.14 to 0.22/ hill and 0.10 to 0.16/ hill in direct seeding and transplanting during 2015. The population difference in two methods of study was found non-significant during both the seasons. The population of *Leptocorisa acuta* with biotic and abiotic factor had non-significant association during both the years.

Keywords: direct seeded rice, foliage feeders, *leptocorisa acuta*, transplanted rice

1. Introduction
Rice (*Oryza sativa* L.) is a staple food for more than 60 per cent of the world's population. In India it is grown on an area of 39.16 million ha with total production of 85.59 million tones while, in Haryana rice is grown on an area of 10.62 million ha with total production of 33.45 million tones. Rice is grown in warm and humid environment which is conducive to the survival and proliferation of insects [2].

The foliage feeders guild of insect pest is also important. Other pests *viz*., the rice whorl maggot, *Hydrellia* sp. cause more damage in flooded fields, 3-4 weeks of transplanting by nibbling the inner margin of leaves. The rice thrips, rice hispa, *Dicladispa armigera* (Olivier), occurring in Andhra Pradesh, Himachal Pradesh, Bihar, West Bengal and North- eastern region, usually damage before flowering [6, 7, 8] The yield losses of 28 per cent in India and between 20-30 per cent in Nepal due to rice hispa have been reported [4, 10]. The armyworm, *Mythimna seperata* (Walker) may be destructive at maturity stage by cutting the ear heads. However, these are sporadic pest and are of regional significance. The rice bug, *Leptocorisa* spp. are considered as another important pest of rice, cause damage by feeding on the sap of milky grains and make them chaffy [6]. In general, yield loss in rice crop due to insect pests has been estimated to be about 25 per cent [5]. Damage during vegetative phase contributes more to yield reduction (50%) than the reproductive (30%) or ripening phase (20%) [9].

Rice is cultivated by various methods in different parts of the world. Water and labour are two major drivers of agricultural change worldwide and in tropical Asia. These two factors have already affected the development of rice based agricultural system in the past and will remain the main factors [1, 17]. Although rice cultivation by transplantation is generally considered the superior method, direct sowing has been successful in some parts of the world [20]. As it saves both labour and water. The shortage of agricultural labour and water scarcity favours the adoption of direct seeding technology in replacement of traditional labour intensive transplanting [3]. In Haryana and Punjab the farmers have great enthusiasm towards direct seeded rice and is grown on more than 40000 ha land. Rice, like other crops needs pesticides for pest control and these are valuable in pest management programme, their consistent use has led to several problems [2]. So the objective is to study the effect of crop establishment methods on incidence of insect pests.

2. Material and Methods
2.1 Experimental site
The experiment was conducted at farm area of Chaudhary Charan Singh Haryana Agricultural

University, Rice Research Station, Kaul (29º 51` 29.5" N latitude, 76º 39` 24.3" E longitude and elevation 230.7m) Haryana during *Kharif* 2014 and 2015.

2.2 Effect of crop establishment methods on incidence of foiliage feeders and *leptocorisa acuta*

Two crop establishment methods *viz*., direct seeding and transplanting were used for raising rice crop during 2014 and 2015. To study the effect of two crop establishment methods, one acre (4000 m^2) plot was divided into two equal halves one each for direct seeding and transplanting.

2.3 Direct seeding

Rice variety Pusa 1121 was sown by seed drill in rows 20 cm apart at a seed rate of 20 kg/ha during second week of June in both the years (2014 and 2015) in a dry well prepared and levelled seed bed. The field was irrigated immediately after sowing to ensure seed germination. For controlling weeds, pre-emergence application of pendimethalin @ 1000g a.i/ha was done after 3 days of sowing. The post emergence herbicide bispyribac sodium (10% SC) was sprayed at the rate of 25g a.i/ha at 25 days after sowing.

2.4 Transplanting

The nursery of variety Pusa 1121was sown during second week of June during both the years (2014 and 2015) on the same day when the direct seeding was done in direct seeding method. The transplanting of 25 days old seedlings was carried out in well puddled field at a spacing of 20x15cm with 2 seedlings/hill. Each plot (direct seeding and transplanting) was divided into 5 blocks/replicates of 400 m^2 area each.

2.5 Observations

Population/ incidence of different insect pests was recorded from 10 randomly selected hills in each block at 7 days interval from 40-45 days after sowing till harvest.

Foliage feeders: (Whorl maggot, rice hispa, thrips and army worm): Total leaves and damaged leaves were recorded to compute per cent damaged leaves.

$$\text{Per cent damaged leaves} = \frac{\text{Number of damaged leaves}}{\text{Total number of leaves}} \times 100$$

Sucking pest: The population of gundhi bug was recorded visually before tapping the plant.

2.6 Statistical analysis: The data obtained in different crop establishment methods on incidence of insect pest and natural enemies were tabulated and statistically analyzed by comparing means with independent sample t-test (Z- test) by using IBM SPSS 19.0 version.

3. Result and Discussion

3.1 Effect on whorl maggot, rice hispa, thrips and army worm incidence

The pooled data on incidence of whorl maggot, rice hispa, thrips and army worm revealed less than one per cent damage in direct seeding and transplanting rice throughout the season during both the years and did not differ significantly. The present findings are supported by Kaur and Singh who reported that the pests did not differ significantly in direct seeding and transplanting method (Table-1; Fig-1 & 2). The similar trend of damage by diplosis in transplanted rice was three times more than direct seeded rice in dry season during both the years, but in wet season crop damage was more in direct seeded during first year and there was no significant difference in next year [12].

The present findings are in conformity as the lower incidence of whorl maggot while higher leaffolder incidence in system of rice intensification (SRI) as compared to transplanting [15, 16, 18, 19]. The percentage of tillers with dead hearts or white heads caused by stem borer feeding and grain yield were higher at closed spacing as compared with wider spacing. However few reports indicated that the less water availability adversely affect whorl maggot incidence [13, 14]. In the present study the differences were not distinct in respect of methods which may be due to very low incidence as these pests are minor and sporadic in Haryana.

Table 1: Effect of crop establishment methods on incidence of whorl maggot, rice hispa, thrips and army worm (pooled) during *Kharif* 2014 and 2015

Damaged leaves (%)							
Month	Standard Meteorologiocal Weeks	2014			2015		
		Direct seeding	Transplanting	t-value	Direct seeding	Transplanting	t-value
August	33	0.93	0.00	1.88*	0.85	0.00	2.92*
August	34	0.99	0.67	0.52	1.12	1.41	0.46
August	35	0.64	0.83	0.49	0.73	0.91	0.43
September	36	0.42	0.53	0.49	0.41	0.44	0.12
September	37	0.25	0.36	0.70	0.27	0.40	0.58
September	38	0.21	0.28	0.42	0.30	0.34	0.19
September	39	0.25	0.32	0.44	0.23	0.39	0.73
October	40	0.29	0.27	0.10	0.22	0.30	0.52
October	41	0.29	0.33	0.24	0.19	0.30	0.67
October	42	0.19	0.29	0.65	0.23	0.29	0.26
Seasonal mean		0.44	0.38	-	0.45	0.47	-

**Significant at 1 % level of significance * Significant at 5 % level of significance

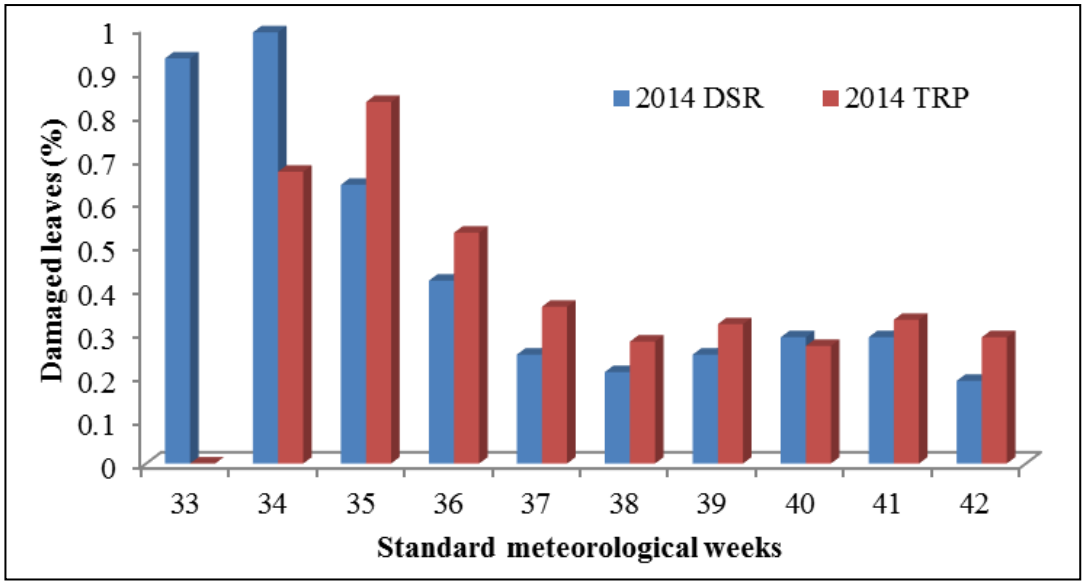

Fig 1: Effect of direct seeding and transplanting method on incidence of whorl maggot, rice hispa, thrips and army worm during *Kharif* 2014

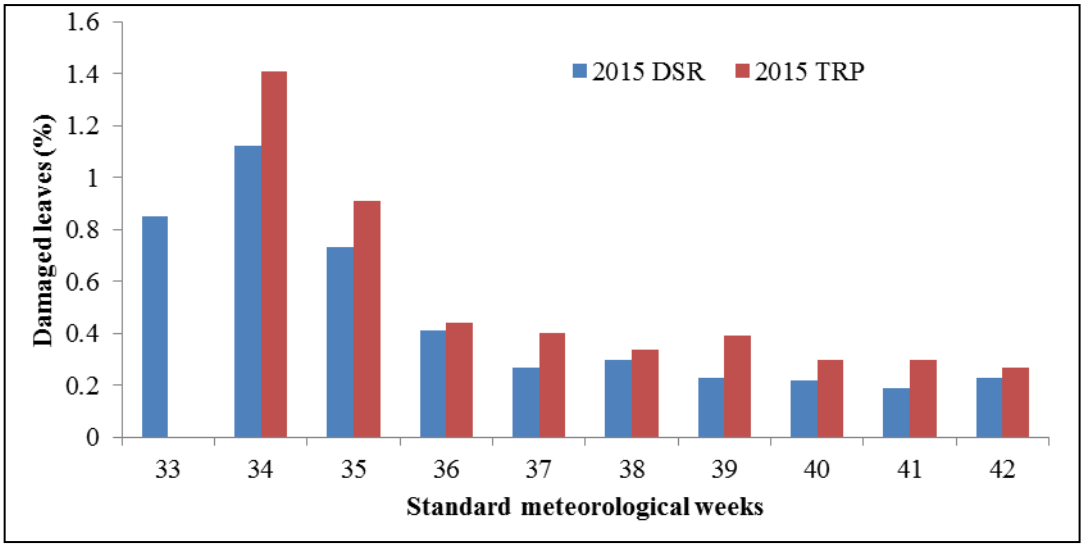

Fig 2: Effect of direct seeding and transplanting method on incidence of whorl maggot, rice hispa, thrips and army worm during *Kharif* 2015

3.2 Effect on population of rice gundhi bug, *Leptocorisa acuta*

The gundhi bug was noticed only at reproductive stage both in direct seeding and transplanting during 38th to 42nd week (Table 2). The population varied from 0.08 to 0.16/ hill in direct seeding and 0.10 to 0.12/ hill in transplanted in different weeks during 2014. The population count ranged from 0.14 to 0.22/ hill and 0.10 to 0.16/ hill in direct seeding and transplanting during 2015 (Fig 3 and 4). The population difference in two methods of study was found non-significant during both the seasons. The population of *Leptocorisa acuta* with biotic and abiotic factor had non-significant association during both the years. Similarly, in the present study the differences were not distinct in respect of methods which may be due to very low incidence as this pest is also a minor and sporadic in Haryana. System of rice intensification as a resource conservation technology compared with transplanting and reported the lower population of rice bug in new method of cultivation provides the prediction of less damage in direct seeding in the area of epidemics [11].

Table 2: Effect of crop establishment methods on population of *Leptocorisa acuta* during *Kharif* 2014 and 2015

Population/hill							
Month	Standard Meteorologiocal Weeks	2014			2015		
		Direct seeding	Transplanting	t-value	Direct seeding	Transplanting	t-value
September	38	0.10	0.12	0.25	0.18	0.14	0.45
September	39	0.16	0.10	0.72	0.22	0.16	0.59
October	40	0.08	0.10	0.31	0.16	0.14	0.24
October	41	0.10	0.12	0.27	0.18	0.16	0.21
October	42	0.12	0.10	0.27	0.14	0.10	0.52
Seasonal mean		0.11	0.10		0.17	0.14	

**Significant at 1 % level of significance * Significant at 5 % level of significance

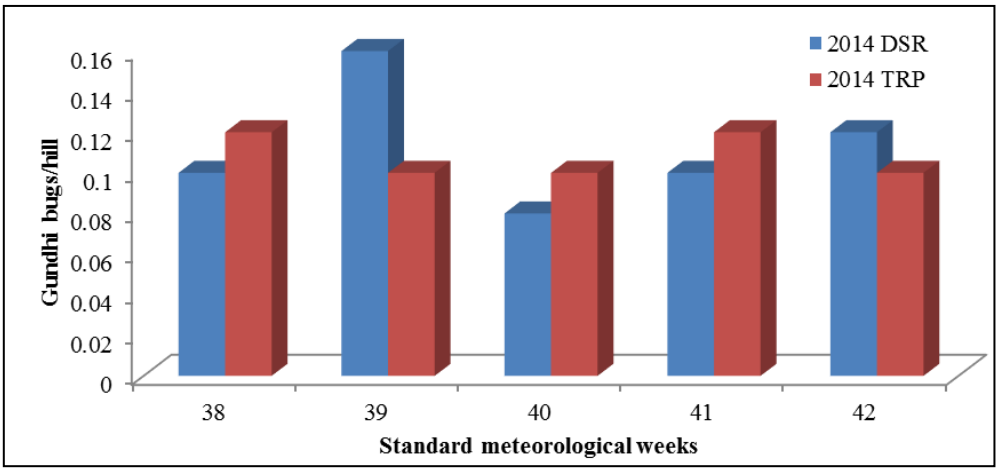

Fig 3: Effect of direct seeding and transplanting method on population of *Leptocorisa acuta* during *Kharif* 2014

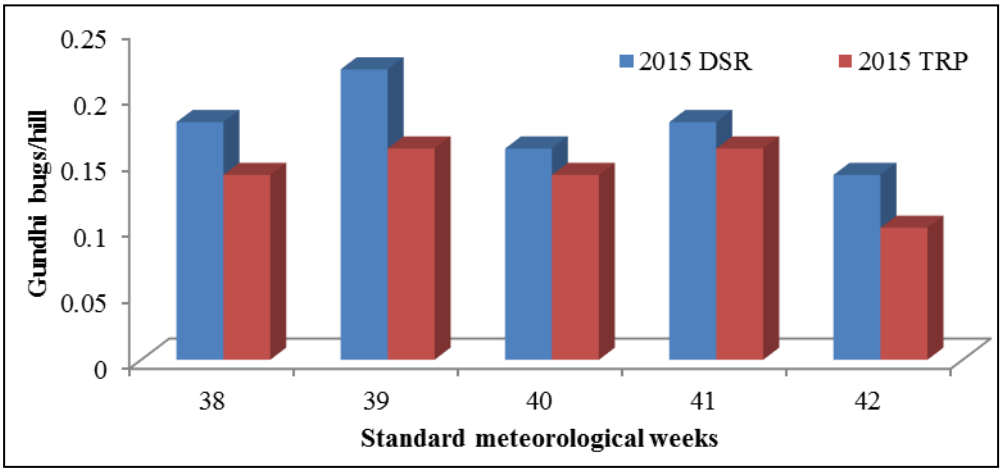

Fig 4: Effect of direct seeding and transplanting method on population of *Leptocorisa acuta* during *Kharif* 2015

4. Conclusion

The pooled incidence of whorl maggot, rice hispa, thrips and army worm was less than one per cent in direct seeding and transplanting rice throughout the season during both the years and did not differ significantly. The *Leptocorisa acuta* was noticed only at reproductive stage both in direct seeding and transplanting during 38th to 42nd week. The population count was very low during both the years. No significant difference was observed between the methods during both the years. The population of gundhi bug showed non-significant association with biotic and abiotic factors during the study.

5. Acknowledgement: Author gratefully acknowledge the guidelines, support and facilities provided by Head Department of Entomology, CCSHAU-Hisar and Rice Research Station, Kaul, Kaithal during the study period.

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