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RESEARCH ARTICLE

STUDIES ON LEAF FOLDER SPECIES COMPLEX AND THEIR DAMAGE POTENTIAL OF POPULAR RICE VARIETIES IN CAUVERY DELTA ZONE

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ABSTRACT

Cauvery delta zone lies in the eastern part of Tamil nadu which occupies 11.12 per cent of geographical area of the state and includes Thanjavur District which is referred as rice bowl of Tamil nadu. Rice leaf folder *Cnaphalocrocis medinolis* (Pyralidse: lepidoptera) and *Marasmia patnalis* Bradley are widely distributed in rice growing areas of the eastern hemisphere except for Europe and Africa. The rice leaf folders become serious pests of rice in recent years in almost all rice growing tracts of India. The percentage of *C. medinolis* among the leaf folder species in Annamalai nagar, Sirkali and Aduthurai were 65.28, 62.00 and 62.90 respectively where as percentage of *M. patnalis* was 34.71, 38.00 and 37.60 respectively. Among the seven selected rice variety ADT-43, ADT-45, ADT-38 and Co-43 were moderately resistant IR-50 and CR-1009 were susceptible and TRY-1is resistant to rice leaf folder complex in Cauvery delta zone.

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INTRODUCTION

Rice, *Oryza sativa* (poaceae) is the most important cereal crop grown in 117countries and is a staple food for people in 39 countries. This includes 2.70 billion people in Asia alone (Sardesai *et al*., 2001). It is cultivated extensively in the most diverse ecosystems of tropical and subtropical regions of the world. India has the largest area among rice growing countries and stands second in production. India produces 104.32 million tonnes of rice on an area of 37 million ha with a productivity of 3.02 tonnes / ha (FAO, 2012). In Tamil nadu, during 2007-08, rice was grown over an area of 19.06 lakh ha with a total production of 57.92 lakh tonnes and average yield of 3.04 tonnes/ ha (Anonymous, 2012). Among the various biotic constrains to rice production, insect pests are of prime importance as the warm humid environment is conducive to survival and proliferation (Heong *et al*., 1995). Cauvery delta zone (CDZ) lies in the Eastern part of Tamil nadu between 10° 00′ - 11° 30′ N latitude and between 78° 15′ - 79° 45′ E longitude at encircles three Districts include Thanjavur, Nagapattinam, Thiruvarur and few taluks of Trichy, Perambalore, Cuddalore and Pudukkottai. Thanjavur is a fertile plain which is referred as the rice bowl of Tamil nadu (Anonymous,2011). Rice leaf folder, *Cnaphalocrocis medinolis* (Pyralidae:Lepidoptera) and *Marasmia patnalis* Bradley are widely distributed in the rice growing areas of the eastern hemisphere except for Europe and Africa (Sakai *et al*., 1942, Gonzales, 1974). The rice leaf folders become serious pests of rice in recent year in almost all rice growing tracts of India. Damage due to *C. medinalis* ranged from 18 to 58 per cent in India (Ramasamy and Jatileksono, 1996) depending on the stage of the crop at the time of infestation. It devastates the rice plants are the vegetative and boot leaf stage causing significant reduction in yield by 48.8- 56.9 per cent (Murugesan and Chelliah, 1983). Bautisia *et al.,* (1984) have clearly shown that loss in yield due to rice leaf folder is positively related to the percentage of damaged leaves in their studies, 17.5 per cent yield loss and loss of 21.3 per cent yield occurred with 26.6 per cent damaged leaves.

Abraham (1958) observed that, it attacked thaladi (kharif) of paddy from October to January in Thanjavur, Tamil nadu. Jaganathan and Chandramohan (1987) surveyed at North Arkot district during January and identified species on the basis of wing marking and found *C. medinolis* to be present to the extent of 53 per cent and *M. patnalis* predominant in Vaniambadi and Walajah divisions while *C. medinolis* in Gudiyatham, Cheyyar and Vellore divisions. Rajendran and Gopalan (1987) collected and identified rice leaf folder at Coimbatore, Tamil nadu, India from January to June, *C. medinolis* accounted for 86 per cent and remaining were *M.patnalis*. Gunathilagaraj and Gopalan (1986) during 1985-86 (Rabi- November planting) found the leaf folder complex consisting of three species. *C. medinolis, M. patnalis and M.ruralis.* The first two were abundant on all sampling dates. The adults of leaf folder can be distinguished based on wing venation (Barrion and Litsinger, 1985). Khan *et al.*, 1988 published a mini review on a bibliography of rice leaf folders

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and described eight species of leaf folders. Eight species comprises the leaf folder complex are, *Cnaphalocrocis medinalis* (Guenee),*Marasmia*(*Susumia*) *exigua* (Butler), *M.bilinialis* (Hampson), *M.patnalis* Bradley, *M.ruralis* Walker, *M.suspicalis* (Guenee). In addition to this leaf folders, *Bradina admixtalis* (Walker) also reported to be a pest of rice (Nakayama, 1929; Lee *et al*., 1973) and a gelechid leaffolder , *Brachmia arotraea* (Meyrick) is reported from India (Lee *et al*.,1973; Natarajan *et al*.,1978). Present study was aimed to identify the leaf folder complex and per cent damage, during Kharif 2009, since limited studies were carried out in Cauvery delta zone.

MATERIALS METHODS

Adult moths of leaf folder were collected weekly by sweep net during the crop period and sorted out by species (Barrion and Litsinger, 1985, Khan *et al*., 1988) based on the wing markings as described below. The individuals belonging to the genera *Cnaphalocrocis* and *Marasmia* differ basically from each other in forewing venation. *Cnaphalocrocis* has R_2 and R_1 (veins 10 and11) stalked and $R_{2\ set}$ close to the trunk of R_3 and R_4 (veins 8 and 9). *Marasmia* has R_2 and R_1 free (Hampson, 1896). These and other morphological features are used to differentiate the leaf folder species.*Cnaphalocrocis medinalis* (Guenee) moth is closely resembles *M.patnalis* differs in having the postmedian line of forewing extended from the costa to the dorsum. The male has a prominent patch of dark brown and shining and raconial scales along the midcosta of forewing.*Marasmia patnalis* (Bradley) is closely resembles *M.ruralis* in coloration and size, but less so wing pattern. However the costa of forewing in the latter is silvery to pale yellow with black dots or strigules. *M.patnalis* has a dark brown costa and possesses no strigulae. Finally the number of species was recorded separately and the percentage was worked out.

The damage potential of leaf folder was assessed in three hot spots from Cauvery delta zone were selected for the present study namely Annamalainagar (Cuddalore district), Sirkali (Nagapattinam district) and Aduthurai (Thanjavur district) where, the farmers cultivate rice crop for three season *viz*., Kuruvai, Samba and Thaladi. The popular varieties ADT 43, ADT 45, IR 50, CR 1009, ADT 38, CO 43 and TRY 1 were selected for the study, because the above are popular in Cauvery delta zone. TN 1 is used as susceptible check. Field trial was conducted in kharif 2009. The nursery bed was raised and each accession was sown. Twenty seedlings of each accession were transplanted in 3 m rows at 2 seedlings /hill. The observations were taken at maximum tillering stage (vegetative) and panicle initiation (reproductive)/peak incidence. Ten accessions in each replication and observed for Total number of leaves and number of leaves damaged by leaf folder larvae. The percentage of damage was calculated as follows,

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

Percentage of damaged leaves was converted to damage rating 'D' as

$$D = \frac{\text{Percentage of damaged leaves in test entry}}{\text{Percentage of damaged leaves in the susceptible check (Average of the susceptible checks)}} \times 100$$

As before, D was converted to 0-9 scale

Scale	D	Resistance category
0	No damage	Highly Resistant
1	1-20	Resistant
3	21-40	Moderately Resistant
5	41-60	Moderately susceptible
7	61-80	Susceptible
9	81-100	Highly Susceptible

(IRRI, 1988)

RESULTS AND DISCUSSION

The data revealed that *Cnaphalocrocis medinalis* was prevalent species in Cauvery delta zone in all the three selected locations. The percentage of *Cnaphalocrocis medinalis* in Annamalai nagar, Sirkali and Aduthurai were 65.28, 62.00 and 62.90 respectively where as the percentage of *Marasmia patnalis* were 34.71, 38.00 and 37.60 respectively (Table-1).The above results revealed that the genera *Cnaphalocrocis* is more prevalent than the *Marasmia*. Chandramohan (1987) reported that the *C. medinalis* was more prevalent species in North Arkot district of Tamil nadu and it is accounted for 53 per cent Gopalan (1987) collected and identified rice leaf folder at Coimbatore, Tamil nadu, India for January to June, *C. medinalis* accounted for 86 per cent and remaining were *M. patnalis*. The present study also revealed that the *C. medinalis* population is higher than *M. patnalis*. The population of *M. patnalis* were slightly increases in the second fortnight of December in all the three locations. Table -2 represents the performance of some popular rice varieties in CDZ against rice leaf folder. Among the seven selected rice varieties four were moderate susceptible to rice leaf folder which includes ADT 43, ADT-45, ADT-38 and CO-43, CR-1009 is susceptible to rice leaf folder and IR-50 is highly susceptible to rice leaf folder. TRY-1 only categorized under moderately resistant variety with average per cent damage of 9.52, 9.00 and 9.48 in Annamalainagar, Sirkali and Aduthurai respectively. The mechanism of resistance may be studied in future.

Table 1. Leaf folder spices complex in Cauvery delta

Month	Annamalai nagar		Sirkali		Aduthurai	
	% of *C. medinalis*	% of *M. patnalis*	% of *C. medinalis*	% of *M. patnalis*	% of *C. medinalis*	% of *M. patnalis*
June	67	33	65	35	68	32
July	83	17	74	26	79	21
August	64	36	61	39	65	35
September	71	29	69	31	70	30
October	65	35	63	37	60	40
November	59	41	55	45	53	47
December	48	52	47	53	45	55
Mean	65.28	34.71	62.00	38.00	62.90	37.60

Table 2. Damage potential of rice leaf folder complex in Cauvery delta during Kharif 2009

Variety	Per cent damage in Annamalai nagar			Per cent damage in Sirkali			Per cent damage in Aduthurai		
	60 DAT	80 DAT	Mean	60 DAT	80 DAT	Mean	60 DAT	80 DAT	Mean
ADT-43	12.10	13.05	12.60 (48.62)	13.10	14.25	13.67 (59.12)	11.68	14.92	13.3 (53.73)
ADT-45	10.32	15.82	13.07 (52.70)	12.32	18.12	15.22 (65.08)	12.75	15.95	14.35 (57.79)
IR-50	20.00	23.21	21.60 (87.09)	19.23	20.32	19.80 (85.60)	20.31	22.23	21.27 (86.00)
CR-1009	18.23	20.75	19.50 (78.62)	17.98	19.75	18.90 (81.71)	19.25	20.25	19.75 (79.80)
ADT -38	10.21	11.01	10.61 (42.78)	9.41	10.27	9.84 (42.54)	10.33	12.05	11.19 (45.21)
CO- 43	12.10	12.90	12.5 (50.40)	11.95	13.01	12.48 (53.95)	12.31	13.45	12.88 (52.04)
TRY-1	9.12	9.92	9.52 (38.38)	8.92	9.01	9.00 (38.91)	9.15	9.81	9.48 (38.30)
TN-1	23.32	26.21	24.80	21.25	25. 01	23.13	23.45	26.05	24.75

Values in parenthesis are Damage rating (D).

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