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Analysis of rice pest constraints based on survey data at Tan Phu Thanh village, Cantho Province

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ABSTRACT

The survey on rice pests constraints at Tan Phu Thanh village, Can Tho province has been conducted since 2000 spring-summer season with the emphasis on finding out the relationship between rice grain yield and pests injuries in three-rice crop irrigated areas. Data collection and analysis addressed the pest appearance dynamics from season to season in the first year. Red stripe disease and leaf folder, thrips and bacterial blight severely damaged in winter-spring season, spring-summer and summer-autumn season, respectively. Weed infestation is one of the major problems appeared in most of rice crops all year round. Many kinds of pests have occurred in rice fields but only some of them significantly affected to rice grain yield.

INTRODUCTION

Rice plant is, naturally, grown under an extremely wide range of environments. While, there are many organisms that are potentially harmful to rice (Teng 1994), for a number of individual rice pests have been derived to estimate damage. A farmer's field is not usually considered as an experience only one injury during a crop cycle, more frequently, several injuries occur, in sequence or simultaneously. The combinations of injuries usually do not occur independently but as sets: "injury profiles", and there is a strong statistical link between these injury profiles and patterns of cropping practices (Savary et al. 1997).

In rice production situation of three rice crops per year, the fallow periods were, usually, short. Most of time in year round, rice was exposed in the fields. These conditions were favourable for maintaining and increasing of rice pests. In addition, the cultivated customs of farmers in Mekong Delta were mainly based on the chemical fertilizer and pesticides. Therefore, the condition of 3 rice crops per year required more and more to input at high dose of fertilizers as well as agricultural chemicals. These practices leaded the changes of pest components and their severity in the rice fields.

Better understanding of the crop management practices x pest interaction, determining the major pests which seriously damaged rice yield, is needed. In order to identify the constraints to productivity, multiple correspondence analysis of quantified survey data at various growth stages of rice plant and crops can help us explain yield variation in relation to pests, seasonal patterns and cropping practices.

OBJECTIVES

- To conduct survey of pest incidence in different farmer's fields across seasons.
- To identify pest injuries of related production system.
- To determine the major pests that severely influence to rice grain yield.

MATERIALS AND METHODS

Research site and planning

In the first season of 2000, the location and farmers with their land units were selected, survey team was formed including experienced plant protection staffs with well-prepared questionaire sheets including: general information containing some important informations on crop management of farmers' practices i.e. fertilizer application, pesticide use and planting density. Then pest injuries was assessed to quantify all injuries due to insects, diseases and weeds. Survey was done in 3 crop growth stages MT

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(maximum tillering), PI (panicle initiation), and ED (early dough), considering of the time profile and injury is under progress curve and its effect to actual grain yield. Measuring the grain yield by survey was started in 2000 He Thu season.

Survey procedure

Sampling and monitoring at farm level were carried out at 11 selected farmer's fields of Tan Phu Thanh village.

Pests and crop data were collected in three successive rice crop per year. In each crop, the monitoring were done at following growth stages:

- Mid-Tillering at 25-30 day after sowing (DAS)).
- Panicle initiation at 45-50 DAS
- Early - Dough/Milk (Based on field observation)

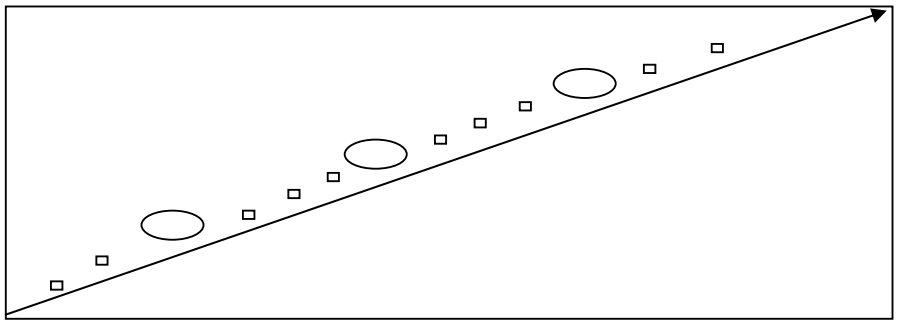

Figure 1. Diagram of sampling to measure the pests and weed infestation

Assessment of all diseases and insect pests were done in 10 quadrates (A wire quadrate of 10 x 10 cm) per field in direct sown rice. Quadrates were selected randomly along the diagonal transect in each field as shown in Figure 1.

The leaves damaged by different kind of insects were recorded by counting number of injuried leaves. For the disease, counting number of leaves with diseased lesions was implemented. Weed infestation was recorded as above and below rice canopy. Grain discoloration and grain yield were also recorded at MA stage (Savary et al 1996).

Data handling

Raw data collected on rice fields were encoded into computer using Microsoft Excel. Compaction of data over time during crop growth is represented by Area Under Injury (and Weed) progress Curve (AUIPC and AUWPC) (Campbell and Madden 1990).

$$\text{AUIPC} = \sum_{1}^{k}[(X_{(1)} + X_{(i-1)})/2]x[DVS_{(i)} - DVS_{(i-1)}]$$

$X_{(i)}$: number of leaves or tillers injured, or converted ratings for weeds.
DVS: development stage at each assessment (using days after sowing).
k: total number of assessments.

Correspondence analysis

All data collected over-year were processed and subjected to multivariate technique for correspondence analysis. The correspondence analysis (Greenacre 1984) is a powerful tool, it generates factors in a way similar to the more well known principal component analysis to explain the complex association of pests in Tan Phu Thanh and its production situations.

RESULTS AND DISCUSSIONS

The occurrence of rice pest components variated and their injuries were seasonally different.

The rice diseases in Spring-Summer and Summer-Autumn season were more abundant than that in Winter-Spring season (Table 1).

Table 1: Disease appearance in the rice field in different seasons in the year

Diseases	[1]Spr-Sm 2000	Sm-Au 2000	Wt-Spr 2000 - 2001
Bacterial Blight	[2]Y	Y	N
Leaf Blast	Y	Y	Y
Brown Spot	Y	Y	Y
Bacterial Leaf Streak	Y	Y	N
Narrow Brown Spot	Y	Y	N
Red Stripe	Y	Y	Y
Sheath Blight	Y	Y	Y
Sheath Rot	Y	Y	N
Stem Rot	Y	Y	N

[1]Spr-Sm = Spring-summer Sm-Au = Summer-Autumn Wt-Spr = Winter-Spring
[2] Y = Disease occurred in the field, N = Disease not occur in the field

The insect pests differently damaged according to a given season. In Winter-Spring season, insect pests were more abundant to occur in rice fields than others (Table 2).

Although, there were many insect pests and diseases occurred in the rice fields, but only some of them were specifically different among seasons and seriously affected to rice plant.

Table 2: Insect pest appearance in the rice field in different seasons in the year

Insect pests and weeds	Spr-Sm 2000	Sm-Au 2000	Wt-Spr 2000 - 2001
Case worm	N	N	Y
Whorl maggot	Y	Y	Y
Leaf folder	Y	Y	Y
Army worm	N	N	Y
Thrips	Y	N	Y
Stem borrer	Y	Y	Y
Weeds	Y	Y	Y

[1]Spr-Sm = Spring-summer Sm-Au = Summer-Autumn
Wt-Spr = Winter-Spring
[2] Y = Pest occurred in the field, N = Pest not occur in the field

The AUIPC of Bacterial blight were highest in Sm-Au season, both 2 seasons Spr-Sm and Wt-Spr Bacterial blight disease were not serious (Fig. 2). In Sm-Au season, rainfall is a major factors in the dissemination of bacterial blight agent, and bacterial blight is often referred to as rain-borne disease (Ou 1984)

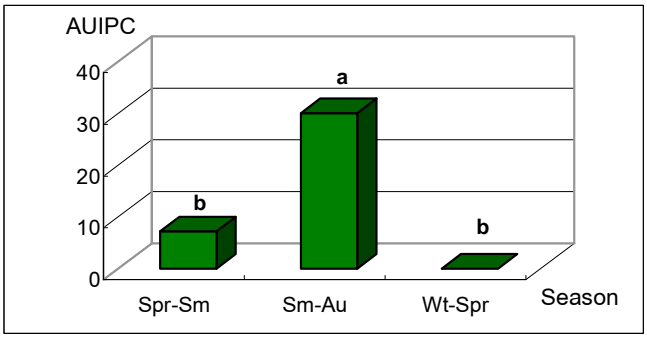

Fig. 2: Variation of bacterial blight in different seasons in a year

The red stripe is a new disease of rice plant, its AUIPC in Wt-Spr is significantly higher than that in Spr-Sm and Sm-Au (Fig.3).

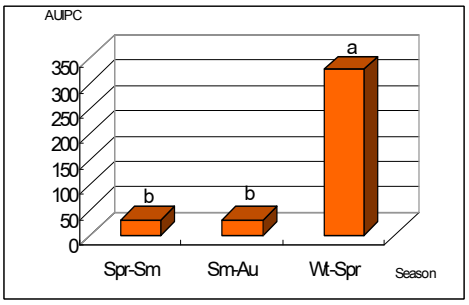

Fig. 3: Red stripe disease on rice plant

Figure 4 showed that sheath blight disease was significantly different among rice crops in a year. It is the highest in Sm-Au season and the lowest in Wt-Spr season.

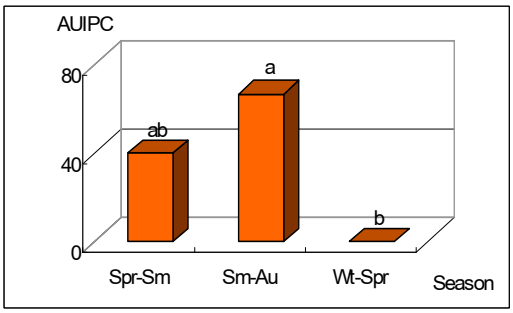

Fig. 4: Sheath blight disease development in rice crop in a year

Similarly, rice leaf folder was significantly different among crops. It is increased from Spr-sm to Wt-Spr season (Fig. 5). In contrast, thrips was most serious in Spr-Sm season. In this season, the dry period condition (Shepard 1995) was favourable for thrips development (Fig.6).

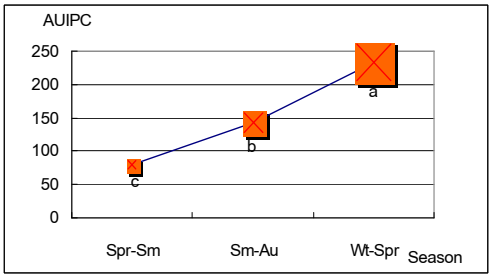

Fig. 5: The development of rice leaf folder on rice crops

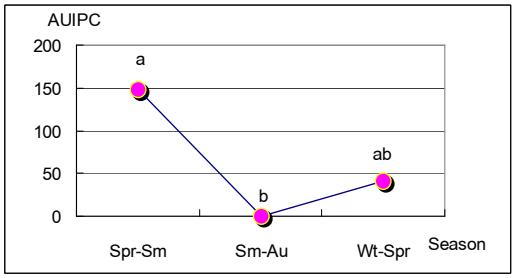

Fig. 6: The appearance of thips on rice crops

The rice yield (Fig.7) of 3 rice crops showed that in Wt-Spr it obtained the highest, and the lowest in Sm-Au season.

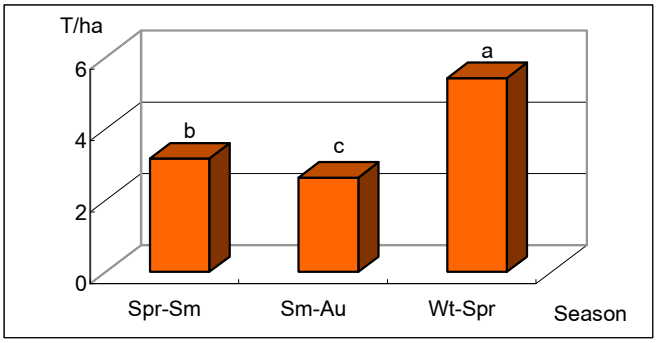

Fig. 7: The variation of rice grain yield of rice crops in a year

Relations between rice grain yield and major rice pests

The variation of rice yield under rice pest effects was determined through an equation as followed

Y = 3,15 + 0,002 (RS) – 0,012 (W) – 0,029 (ShB) –0,018 (NBS) + 0,003 (LF)
*(R^2 = 0,93**, n = 27, F = 44,41, P<0,0001)*
While: Y = grain yield; RS = Red stripe disease; ShB = Sheath blight disease; W = Weeds; NBS = Narrow brown spot; LF = Leaf folder

Total 17 variables of rice pests were used for regression analysis related to rice grain yield. The results of stepwise multiple analysis indicated that there were some major rice pests which were closely relation to rice yield such as red stripe disease, weed infestation, sheath blight, narrow brown spot and leaf folder.

CONCLUSION AND SUGGESTION

The rice pest and disease occurrence and damage on rice crop seasonally differed. Red stripe and leaf folder became serious in Wt-Spr season, while thrips, sheath blight and bacterial blight in Spr-Sm and Sm-Au seasons. Under intensive cultivation system, some of the most major rice pests and diseases affected grain yield were noticed as red stripe, sheath blight, narrow brown spot, leaf folder and weed infestation.

This survey need to be furtherly continued, beside of rice pests and diseases, cropping practices should be included to submit for analyzing the factors that are considered as major constrains of rice yield.

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SUMMARY IN VIETNAMESE

Phân tích số liệu điều tra dịch hại trên lúa vùng thâm canh tại xã tân phú thạnh tỉnh cần thơ ở vùng ĐBSCL

Điều tra về dịch hại trên ruộng lúa thâm canh ba vụ tại xã Tân Phú Thạnh, tỉnh Cần Thơ được thực hiện từ vụ Xuân hè năm 2000 với mục đích tìm ra mối tương quan giữa năng suất lúa và các loài dịch hại. Sau một năm, kết quả thu thập số liệu và phân tích cho thấy các loài gây hại xuất hiện điển hình theo mùa vụ. Bệnh vàng lá và sâu cuốn lá gây hại nặng trong vụ đông xuân, bù lạch và bệnh cháy bìa lá nghiêm trọng thứ tự ở các vụ xuân hè và hè thu. Cỏ dại là một trong những dịch hại chính trên lúa và xuất hiện trên hầu hết các vụ lúa trong năm. Mặc dù có nhiều loài dịch hại có mặt trên đồng ruộng nhưng chỉ có một số loài là có ảnh hưởng rõ rệt đến năng suất lúa.