Management of Rice Planthoppers in Vietnam

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Abstract

The Brown planthopper (BPH), *Nilaparvata lugens* Stal and the White backed planthopper (WBPH), *Sogatella furcifera* Horvath are two serious pests throughout Asia. The dominance of BPH or WBPH in each zone depends on ecological conditions where the different types of varieties have been cultivated. In Southern Vietnam, BPH has been dominant for a long time due to the widespread of elite resistant varieties originated from the International Rice Research Institute (IRRI). It was frequently reported since 2000 that BPH transmitted ragged stunt virus and grassy stunt virus in Southern Vietnam. On the other hand, hybrid and inbred varieties have been imported from China in Northern Vietnam where WBPH has become a major pest. The light trap data showed that the proportion of WBPH is recently 60-70% of rice planthoppers in the Northern part while this percentage is only 2- 4% in Southern provinces.

The virulence of BPH population is quite different in Vietnam. The virulence of BPH in Northern and Central Vietnam are moderate and almost same level. However, The virulence of BPH in Southern Vietnam, is stronger than those in Northern and Central Vietnam. The virulence of BPH population in Northern Vietnam is changing these days although the area of resistant varieties is limited in the region.

During the winter-spring season of 2008, WBPH occurred with high density in several Northern provinces. At the second generation of BPH (just before heading stage), they seriously damaged rice field and caused 72% of yield loss because of " hopper burn" symptom. The breeding resistant rice varieties against BPH in Southern and against WBPH in the Northern Vietnam are extremely importance.

Key Words: rice plant hopper, WBPH, BPH, RRSV (Rice ragged stunt virus), RGSV (Rice grassy stunt virus), resistant variety.

Introduction

The Brown planthopper(BPH), *Nilaparvata lugens* (Stal) and the Whitebacked plant hopper (WBPH), *Sogatella furcifera* (Horvath) are two serious pests throughout Asia. In the context of rapid industrialization and urbanization, rice production in Vietnam has achieved a considerable progress. However, the change of ecological system with an emphasis of using widely Chinese varieties (especially hybrid rice varieties), using numerous crops per year, high seed rate pesticides and nitrogen application in the South of Vietnam are the reasons leading to the change of the situation of rice plant hoppers and virus diseases. In the North, with virulent variation of BPH and outbreaks of WBPH in a large scale and In the South, period of 2005-2007, destroyed areas by BPH nearly 600.000 ha and infected virus disease 400.000ha. In the year 2008, over 180

thousand ha has infected by BPH in which 10.632 ha infected by virus diseases. Sustainable of rice production are threatened by rice planthoppers and virus diseases. Some research results of PPRI will be presented in this paper.

Materials and methods

Materials

Rice varieties: Rice varieties (hybrid and inbred rice) used for experiments were collected from both Northern and Southern Viet nam.

BPH and WBPH: 5 BPH strains were collected from the different provinces and areas in the North and South.

RRSV, RGSV diseases were evaluated in the greenhouse and surveyed in the field in the South.

Methods

The light trap were set up in 3 main regions (Northern, centre and Southern). The light was turned on at 19:00h everyday and the sample was collected and analyzed in the next morning.

The ratio of RRSV, RGSV diseases has evaluated following the method of IRRI.

The demonstration of rice production was presented in the South following PPRI's method.

Results and discussion

1. The density of rice planthopper in Northern Viet Nam in the recent year.

From 1990s to now, the rice structure in Northern Viet Nam has changed toward fast increasing hybrid rice areas (in the year of 2000 there were only 435.508 ha, but the year of 2008 it was 642.000ha). This has been changing the role and position of two species of rice plant hopper towards the opposite direction. The position and the role of WBPH has dominated comparison with BPH in some recent years. In the year of 2000,WBPH were broken out in the winter- spring crop and the hopper burn symptom occurred in Northern Viet Nam (Fig 1).

Table 1: Hybrid rice areas in Northern Viet Nam

Year	Total		Spring season		Summer season	
	Area (ha)	Yield (ton/ha)	Area (ha)	Yield (ton/ha)	Area (ha)	Yield (ton/ha)
1992	11.094	5.77	1.156	7.20	9.938	6.10
2000	435.508	6.44	227.615	6.50	207.000	6.37
2005	588.000	6.50	353.000	6.50	235.000	5.56
2007	620.000	6.50	400.000	6.50	220.000	5.68
2008	642.000	6.40	422.000	6.40	220.000	5.48

(source: National Extension Agriculture Centre-2008)

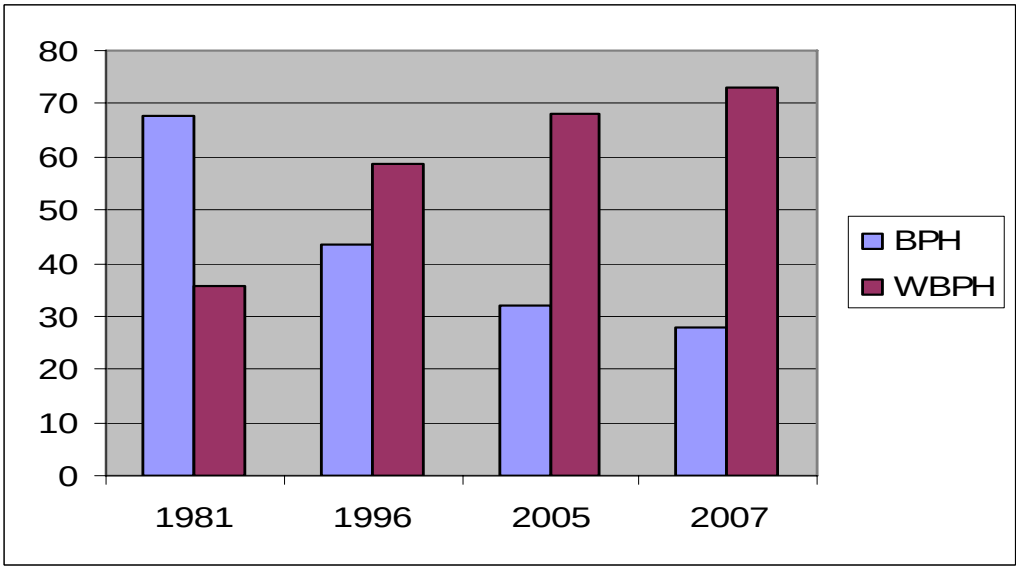

Fig.1. The rate of BPH and WBPH in the field in Northern Vietnam

The investigation in the fields of Northern Vietnam showed that the high peak of BPH occurred in the pre- ripen stage to the ripen stage, while the tillering to booting stage of rice were sensitive to WBPH. The peak of BPH and WBPH adults in the field coincided with the pick of that in the light trap. There were 6-7 generations of rice plant hoppers in the year in which WBPH generation appeared at the end April - early May and early September are the most serious and necessary to control. In the winter season, with lower temperature, WBPH and BPH could be presented in the fields but their life cycle is longer.

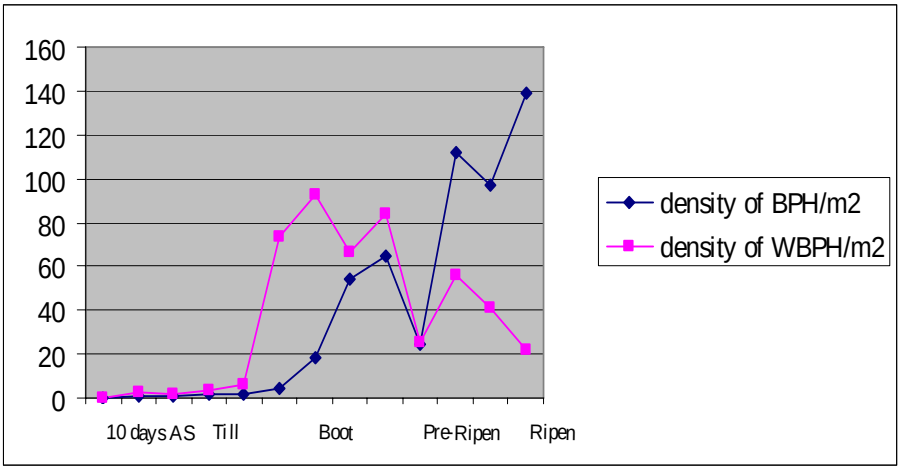

Fig.2.The density of BPH and WBPH in spring-winter season in Ha Tay province - Northern VietNam-2008

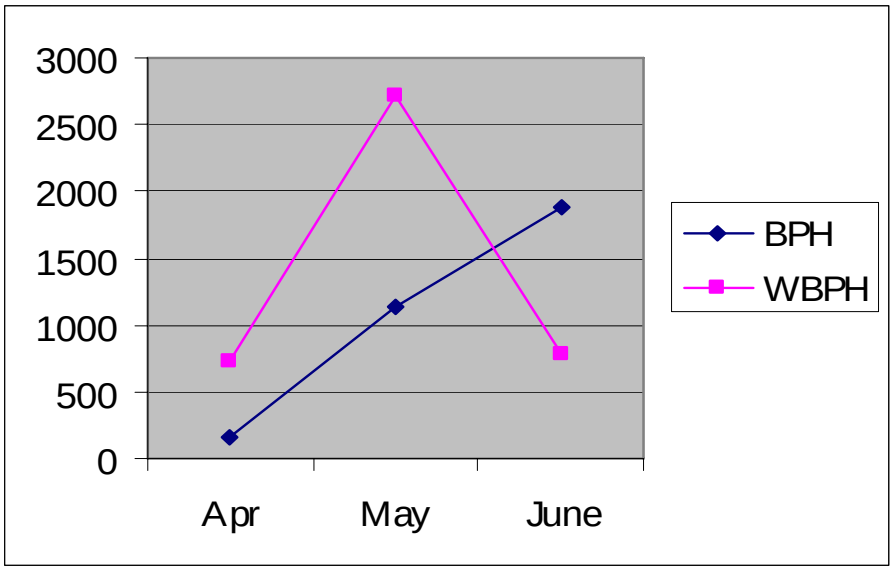

Fig.3. Population dynamic of BPH and WBPH in spring-winter seasonin Hai Phong Province-Northern VietNam-2008

The density of BPH and WBPH are different in different rice varieties. With the varieties such as hybrid rice, inbred rice originated from China and sticky rice, they had higher density than the inbred rice from IRRI(fig 4 and fig 5).

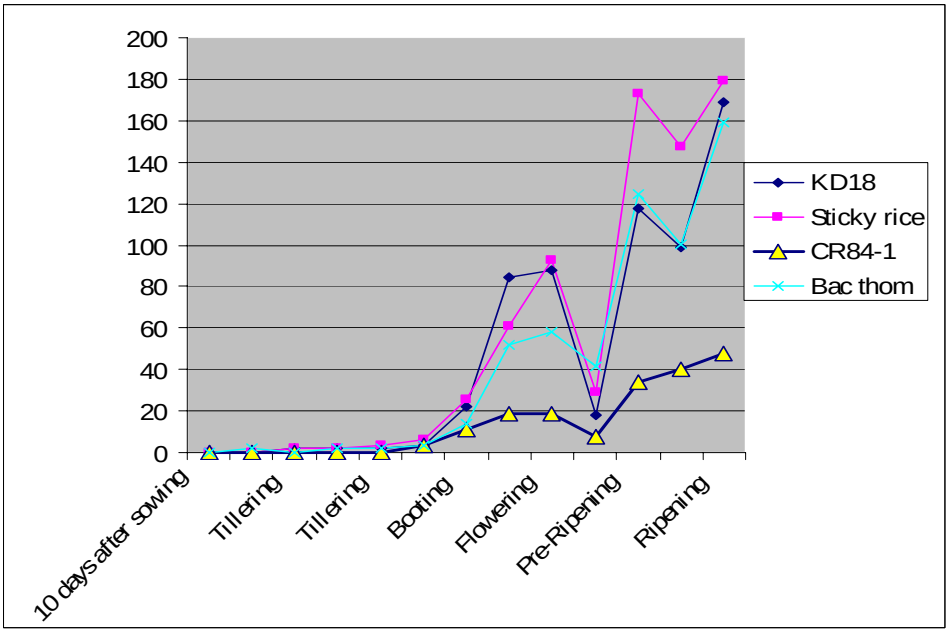

Fig.4. Population dynamic of BPH in spring-winter seasonin Hai Phong-Northern VietNam-2008

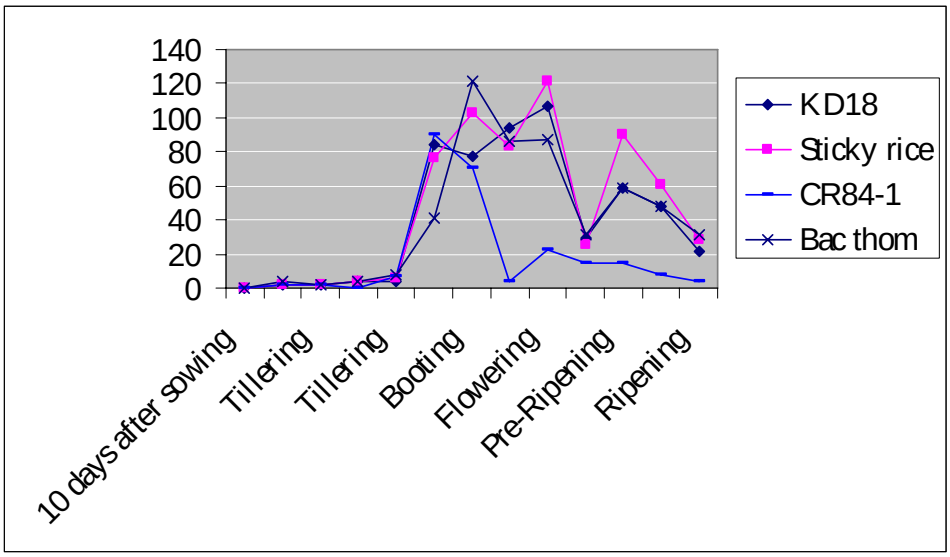

Fig.5.Population dynamic of WBPH in spring-winter season in Hai Phong-Northern VietNam-2008

2. The density of the rice planthopper in Southern Viet Nam and virus diseases in the recent year.

- In the years of 2005-2007, the infected area of virus diseases causing by BPH outbreaks were the highest. Total paddy rice production lost was around 400.000 tons in 2006. The appearance of BPH was all the time in the field. The reasons to make high BPH density were suggeted that there were synchronized cropping season, using more nitrogenous fertilizer; susceptible varieties and over chemicals in the field .

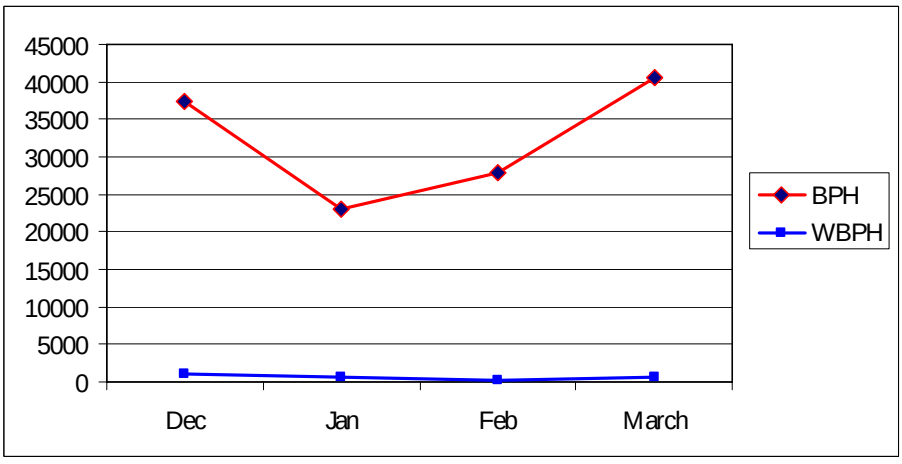

Fig.6.Population dynamic of BPH in the field of Thu Thua- Long An-2007

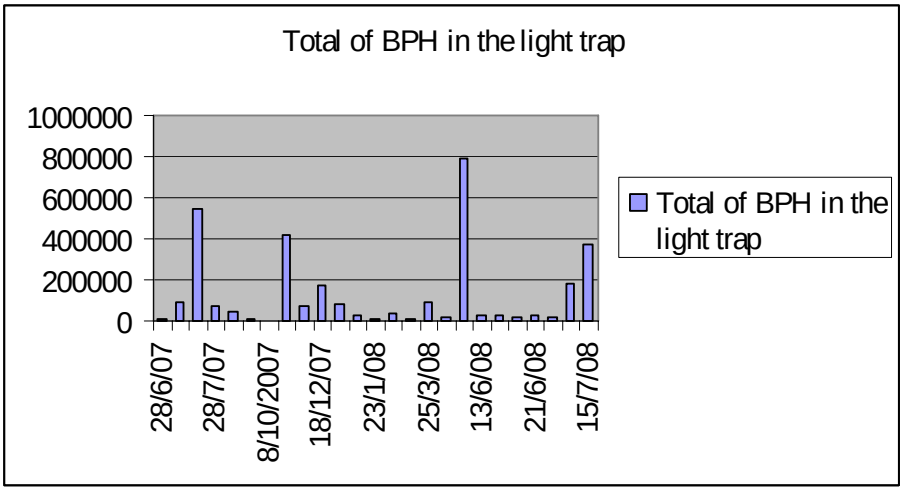

Fig.7. The density of BPH in the light trap in Long An-2007

The light trap datas in the South indicated that the dominant proportion of BPH comparison with WBPH from 1979 to 2008 due to both 2 periods using the same rice varieties originated from IRRI (Fig 8).

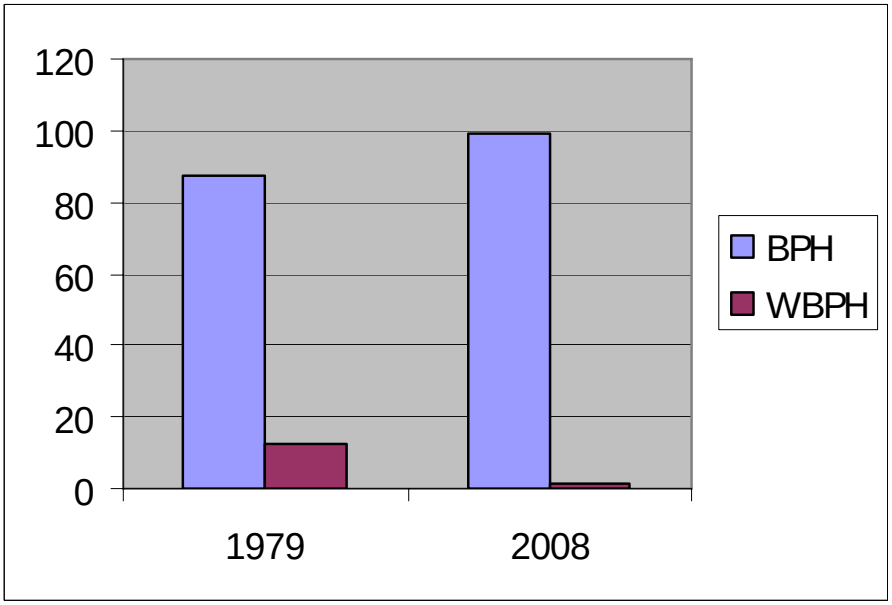

Fig.8. The ratio of BPH and WBPH in Long An

There was no difference between egg and nymph stage of BPH rearing on rice infected by virus and healthy rice, but the adult stage of BPH rearing on rice infected by virus was about 5 days longer than BPH rearing on healthy rice (Table 2).

Table 2: The time of nymphal stages between healthy rice and infected rice.

Stages	**Time of nymphal stages(date)**		
	healthy	**RGSV infected plant**	**RRSV infected plant**
Egg	7.23± 0,42	7,18± 0,45	7,27± 0,45
Nymph	14,14± 0,54	13,43± 0,47	13,8± 0,68
1 st	3,23± 0,42	3,09± 0,41	3,28± 0,45
2 st	2,32± 0,47	2,39± 0,49	2,36± 0,48
3 st	2,41± 0,49	2,43± 0,5	2,4± 0,49
4 st	2,68± 0,56	2,35± 0,48	2,44± 0,5
5 st	3,5± 0,58	3,17± 0,38	3,32± 0,47
Pre- oviposition	3,36± 0,77	2,4± 0,66	3,0± 1,04
Adult	22,36± 6,25	17,48 ± 4,33	17,84± 3,33

Food	Number of eggs/female BPH	Number of hatched egg	The rate of the hatched egg (%)
Healthy plant	193± 23,49	185,9± 23,41	96,29± 1,39
Rice infected RRSV	145,38± 19,42	130,5± 19,42	89,62± 2,24
Rice infected RGSV	134,78± 20,23	121,11± 19,49	89,74± 2,64

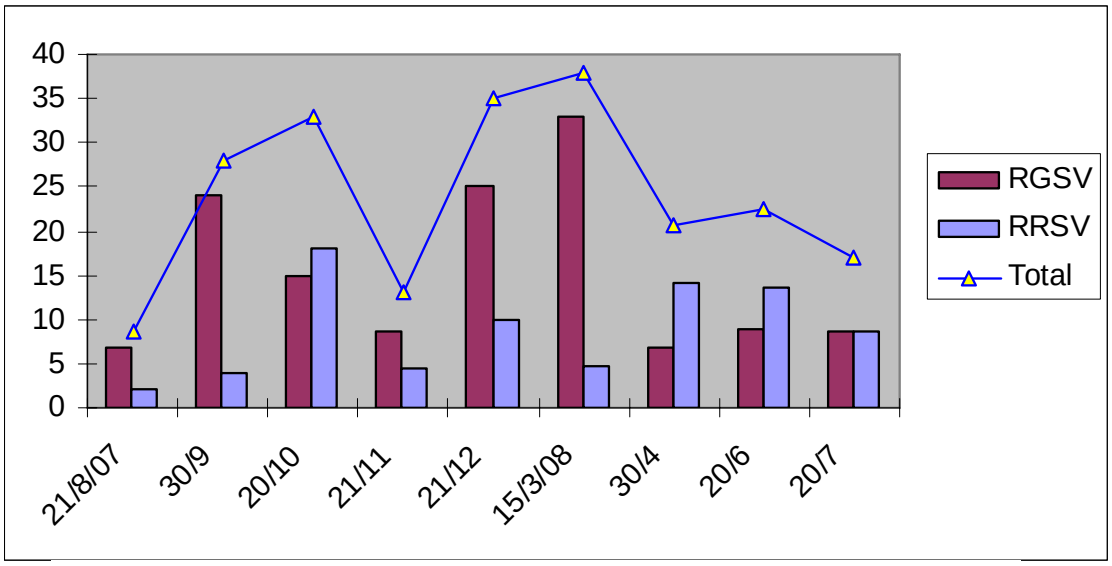

Fig 9. The ratio of two virus diseases in the field in Long An-2008

3. Demonstration fields

Table 3: The result compared between applying escape strategy in the demonstration

Season/ location	Demonstration			Farmer field	
	Areas	Rate of disease (%)	Yields (ton/ha)	Rate of disease (%)	Yields (ton/ha)
spring- winter (2006-2007)					
Long An	78.5	1.7	8.6	39.1	6.8
Summer- autumn (2007)					
Long An	45	4.3	6.2	7.9	6.0
Tra vinh	110	2.7	6.8	2.6	6.3
Autumn- winter (2007)					
Tra vinh	110	1.8	6.8	1.7	6.1
Spring –winter (2007-2008)					
Long An	45	4.3	6.7	15.7	6.4
Tra vinh	110	2.5	6.6	7.4	5.9

- Results of 7 demonstrations carried out at Long An and TraVinh using diseases management with escape strategy and synchronized cropping season base on light trap systems showed that the rate of disease is lower and the yields is higher than farmer fields. These are the moderns to present for expanding rice production in the south.

Table 4: Virulence of the BPH strains in three areas of Vietnam-2008

Variety	Resistant gene	HaTay	Khanh Hoa	Long An
Tai chung 69	None	7.5	9.0	6.4
Tai chung 65	None	9.0	9.0	7.0
TN1	None	9.0	9.0	9.0
Mudgo	Bph1	8.5	8.3	6.0
N22	Bph1	-	-	6.5
ASD7	bph2	9.0	9.0	7.5
Rathuheenati	Bph3	6.3	6.3	5.3
ADR52	Bph3	-	-	6.0
Babawee	bph4	6.3	5.0	5.3
Swarnalata	Bph6	5.0	5.7	5.2
Mangan	Bph6	-	-	5.6
T12	bph7	5.0	5.7	-
Chinsaba	bph8	6.3	5.0	5.3
Ptb33	bph2+Bph3	1.0	-	3.0

The virulence of BPH population in Khanh Hoa seem to be similar to that in HaTay- HaNoi. Overall, the virulence of BPH in the South was higher than that in the North.

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