

Neonicotinoids and the Rice Plant Hopper Outbreak in Asia

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中国粳稻とセジロウンカ

Whitebacked planthopper in Chinese japonica rice



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Rice Plant Hopper which threatened the "Green Revolution" by Dr. Kazushige Sogawa, Oct.25, 2010; Last Chapter

In the Spring of 2008, I went to IRRI where I first visited 40 years ago. Half a century has passed since the IMP started, and during the past 20 years, FAO has been successful in stopping the resurgence of BPH through the IPM program. The use of organic phosphate pesticides has decreased drastically. In the paddy field of IRRI, there was no more powerful BPH which once gave me so strong impression!

「緑の革命を脅かしたイネウンカ」
寒川一成著、2010年10月25日
星雲社より発刊

(終章より) 2008年春、40数年前の青春時代に初めて訪れたフィリピンの国際稲研究所にやってきた。IPMが登場して半世紀が過ぎ、熱帯アジアでFAOのIPM普及事業が発足してから約20年が経っている。FAO主導のIPM普及事業によって、1980年代後半から1990年代にはトビイロウンカのリサージエンスを引き起こしていた有機リン系殺虫剤の使用が目に見えて低減し、トビイロウンカの連鎖的大発生が収まった。

Outbreak of BPH in Indonesia and IPM by FAO expert in 1986-1991

Japan Times, May 12, 1992

WORLD/ENVIRONMENT

Cutting pesticide use increases rice yield

FAO report points to successful program in Indonesian fields

WASHINGTON (UPI-Kyodo) Reducing pesticide use in tropical rice fields increases production while simultaneously protecting the environment, United Nations officials said in a report scheduled for release Monday.

The U.N. Food and Agriculture Organization said its Integrated Pest Management Program in Indonesia successfully trained 200,000 farmers to grow rice without the heavy pesticide use that had become common. From the program's start in 1987 to early 1991, rice production increased more than 10 percent.

"Instead of just looking at any insect as being bad, there are insects that defend the

crop. It is the ratio of insects that defend the crop to the ones that destroy the crop that needs to be managed," said Peter Kenmore, manager of the program in Indonesia.

"We showed on a small scale that individual farmers could learn these things," Kenmore explained.

Rice production increased since the 1960s, when modern seed production, fertilization and irrigation techniques were brought to Indonesia and other developing nations in a process called the Green Revolution, Kenmore said. However, the use of pesticides, which began at the same time, jeopardized the

increased food production.

By wiping out all insects in a rice field, including those that protect the crops from parasites, the pesticides made the crops more vulnerable to parasitic attacks, Kenmore said.

"Increasingly across Asia and, most spectacularly, in Indonesia, there were outbreaks of insects that threatened to reverse the gains of the Green Revolution," he said.

In 1986, Indonesia banned 57 of 63 pesticides that were being used on rice and increased the training of farmers on pest management without the chemicals. Of the farmers trained in the program, the

average pesticide use went from more than four applications per season to fewer than one, Kenmore said, and rice yield increased 10.1 percent.

The training proved effective at reducing a threat from brown plant hopper infestation, which was attacking supposedly resistant rice varieties in 1986.

"Farmers get excited, because they are seeing something in their fields they haven't seen before, seeing the natural enemies of the pests destroying the brown plant hopper without having to drench their fields in insecticides," Kenmore said.

"They get excited about it

and start telling other farmers. It is a personal transformation for both the farmers and the bureaucrats," he added.

The program saved Indonesia \$120 million in pesticide subsidies, reduced environmental damage from pesticide production and use, and cut farm production costs, Kenmore reported.

He hopes to expand the program so that 1 million farmers have the necessary training by 1997. The FAO also is working to expand the program to other nations in the region, including Bangladesh, the Philippines, Thailand and Vietnam.

The Rice Planthopper(RPH) Problem is Happening Again!

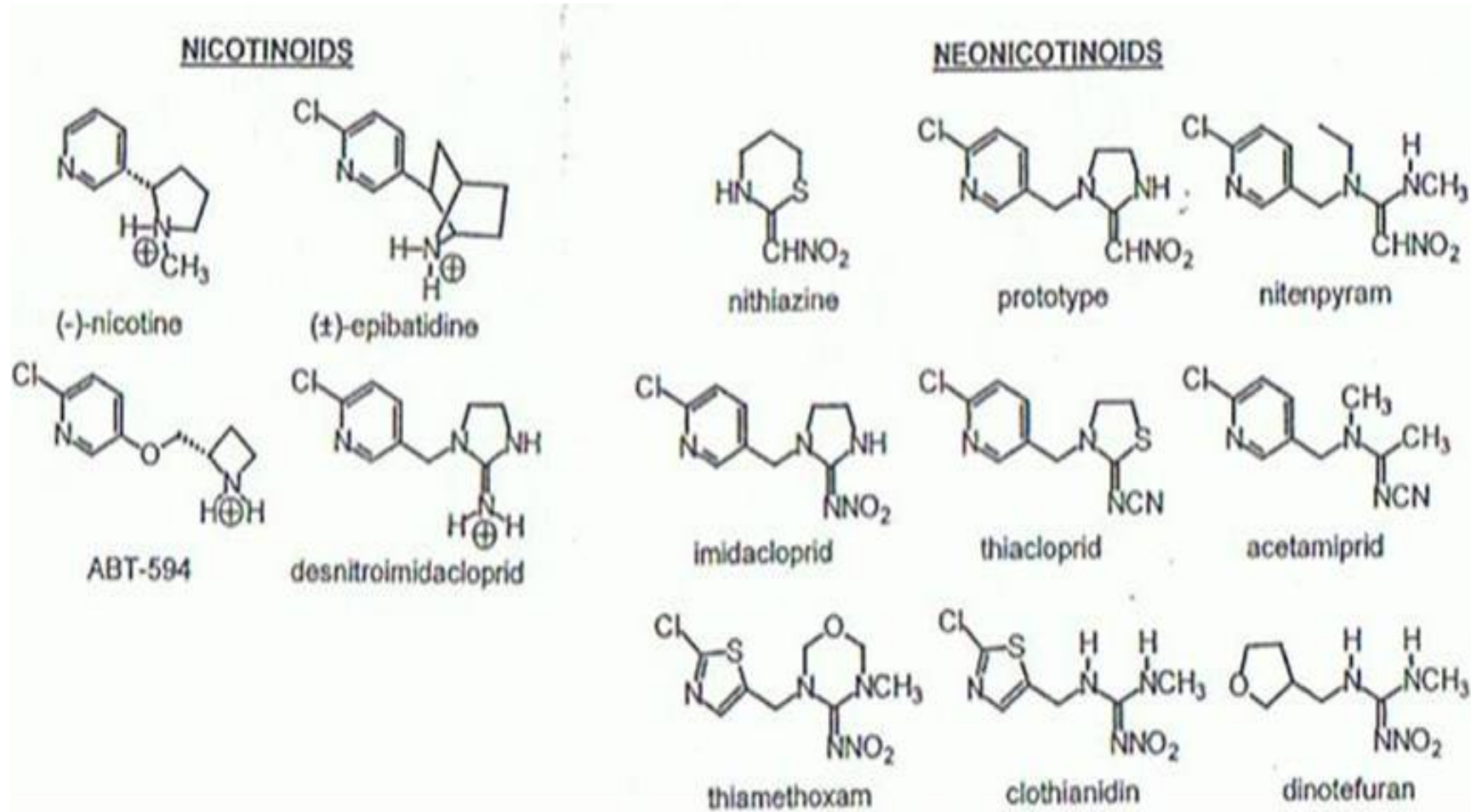
However, in recent years, the problem of BPH which seemed to be terminated already, is coming up again in the paddy fields of various places in tropical Asia.

Neonicotinoid insecticides *were introduced under the IPM program, but gave serious impacts on the eco-system of paddy field. They have nicotine-like structure, penetrate into the rice plants and effective at low concentration for long term*

ネオニコチノイドに耐性を持つトビイロウンカの出現

ところが、一旦は終息したかに見えたトビイロウンカ問題が、熱帯アジア各地の水田で再燃し始めている。IPMとの協調を謳って登場したネオニコチノイド系殺虫剤が、水田生態系に深刻な影響を与えている。天然の殺虫成分であるニコチンに類似した化学構造と、イネ体内に浸透し低濃度で長期間殺虫毒性を持続するネオニコチノイド系殺虫剤は、環境にやさしく、天敵生物への影響が少ないとされてきた。更に農民に対しても安全で省力的、かつ経済的とされてきた。ところが、その負の影響は、まずネオニコチノイドに耐性を持つトビイロウンカの出現となって現れた。
(文献; Matsumura M., et al., *Pest Management Sci.*, 64; 1115-1121, 2008)

The Chemical Structure of Neonicotinoids



Neonicotinoids

*The **Neonicotinoids** which chemically resemble nicotine, a natural insecticide, and keeps insecticidal property for a long period by penetrating into the rice plants was believed to be eco-friendly, and not so much adverse effects on predators or on human health. However, the negative effects have appeared as BPH resistant to Neonicotinoids.*

BPH has developed resistance power against Neonicotinoids

- . *The negative impact of **neonicotinoid** appeared in the form of BPH with the **resistant power** to the pesticide.**

* **Matsumura M.**, et al., *Species-specific insecticide resistance to imidacloprid and fipronil in the rice planthoppers *Nilaparvata lugens* and *Sogatella frucifera* in East and South-east Asia. *Pest Management Sci.*, **64**; **1115-1121**, **2008**.*

In the Case of Thailand

*In Thailand where **Imidacproprid** has been continuously used to control BPH, the effectiveness against BPH gradually decreased from 2003-2005, and as a result of random use of insecticides such as **Abamectin, Cybamethrin** or **Chlorpyriphos**, extensive outbreak of BPH has been happening since 2008!*

Ref; K. Sogawa, *Green Revolution threatened by Rice Plant Hoppers, 2010*

タイの事例

トビイロウンカの防除にイミダクロプリドを連用してきたタイでは、2003～2005年頃から、トビイロウンカに対する防除効果が減退し始めた。効かなくなったイミダクロプリドに代わり、大量に出回ったアバメクチン、サイバメスリン、クロルピリフォスなどの殺虫剤が乱用され、2008年からトビイロウンカの大規模なリサージェンスが起こっている。

Thailand(continued)

The Hopperburn which has started in the rainy season of 2009 in three Provinces of Central Thailand has spread over 18 Provinces. Moreover, the virus accompany BPH is also widely spreading .Thai Government allocated special budget for insecticide, and started campaign to control BPH by insecticide. But, this policy lead to more outbreak of BPH

タイの事例(続き)

2009年雨期に、タイ中央平原の3省から始まったホッパーバーンが、またたく間に18省に蔓延し、さらにトビイロウンカが媒介するウィルス病が流行し始めている。タイ政府は殺虫剤調達のために特別予算を計上し、殺虫剤によるトビイロウンカの防除を促すキャンペーンを展開した。しかし、国際稲研究所でIPMの研究と普及に長年携わってきたヘオン氏は、このような措置が、火にガソリンを注ぐような結果になるのではないかと警告を発している。

"Hopper Burn" by BPH and the Virus
(January 25, 2010 in Suphan Buri, Thailand)



So many small hoppers were seen on the stems of rice plant



Imidacroprid, Neonicotinoid Insecticide,
sold in a pesticide shop in Suphan Buri,
Thailand(on the right), 2010



In 2009, Whitebacked Planthopper Outbreak happened in Yunnan Province for the first time, so Prof. Rongping organized an Seminar in Nov. in Yunnan.



The Case of China

In 2005, BPH outbreak has happened suddenly after the decrease of the case over the long period since 1999.

*It happened when **Imidacproprid(Chinese name; Peetsuolin)**, the typical **neonicotinoid** insecticide became ineffective against BPH. Almost all the rice plants of the experimental paddy field of Chinese Rice Research Institute have died.(Ref. **Sogawa, Green Revolution threatened by Rice Planthopper, 2010)***

China Case(continued)

About 40% of all the paddy fields in Sekko Province was damaged, and rice harvest was none in the 14,000ha among the affected area.

Since then, there has been continuous outbreak of BPH in China.

Neonicotinoid 「虫司令」Made in China
(Chong Si Ling; active ingredient; *Imidacloprid*),
sold in the market in Cambodia(July 2011)



中国の事例

中国水稻研究所で過ごした最終年の2005年に、1999年以来減少していたトビイロウンカが突然大発生した。代表的なネオニコチノイド系殺虫剤であるイミダクロプリド(中国名;ピーツオンリン)が効かなくなった途端に大発生した。研究所の過半の試験田がほぼ前面枯死した。浙江省だけでも、40%の水田が重大な被害を受け、その内14000haが収穫皆無になった。以来、トビイロウンカの多発が続いている。

Vietnamese Government Officials, NGOs and Farmers also joined the Seminar



The serious outbreak of WBPH in the Mekong Delta region in Vietnam where the Chinese hybrid rice varieties were intensively introduced, may retard all the effort and achievement of IPM to reduce the use of pesticides in the past 20 years! Also, the overuse of pesticides will destroy the mechanism of biological control by paddy ecosystem!

米価高騰をもたらしたベトナムでのトビイロウンカの大発生

ベトナム南部のメコンデルタでは、トビイロウンカは1991年～1992年の大発生の後、少発状態を保っていた。しかし、2006年から再び多発し始め、トビイロウンカが媒介する稲ウィルス病の大流行に悩まされている。2007年、ベトナムはウンカとウィルス病の被害が原因で米の輸出を抑制した結果、周辺の米輸入国で米価が高騰し、大きな社会問題となった。いわゆる2008年のライスクライシスである。

Adverse Effects of Neonicotinoid Insecticides

- **Noenicotinoid type insecticides are known to affect the nerve system of honey bees, and make them unable to return to their nest. As a result, honey bees are disappearing from the areas where neonicotinoid insecticides has been used.**
- **Not only honey bees, but also various natural enemies, especially those belonging to bee family, will be killed by the use of neonicotinoids. Thus, natural eco-system which can control the population of rice planthoppers within certain level, will be destroyed.**
- **You will see the example of such case in the film, “Hopper Race” produced by TVE Japan in 2013.**

水田生態系を破壊する ネオニコチノイド

- 浸透性殺虫剤のネオニコチノイドとフィプロニルは、ミツバチの神経系統を破壊して帰趨能力を奪ったり、殺すことが知られている。
- さらに、ミツバチだけでなく、水田の生態系の一部として、イネウンカの爆発的な増加を抑えている天敵には、これから見ていただく
- フィルムに登場するハナモグリコバチのように、イネウンカの卵に自分の卵を産み付けてウンカの数进行をコントロールする蜂の仲間もあり、ネオニコチノイドの使用は、こうした水田の生態系を破壊する。

Comparison of China, Thailand and Vietnam with Lao PDR

- China, Thailand and Vietnam; Introduced hybrid varieties or high-yielding variety of rice over 50%, In most areas, rice is grown twice or three times a year. By the heavy use of insecticides, the predators were killed, while RPH got resistance to insecticides, and quickly multiply with their food available all through the year, leading to the outbreak of RPH!
- Lao PDR; According to the JICA experts in RISEP, most of the farmers are growing *traditional variety* of sticky rice for domestic consumption, and there is not so much need to use insecticide . As a result, the ecological balance of pest(RPH) and the predators are maintained. There is no outbreak of RPH in Laos!

Ref. "Occurrence and insecticide susceptibility of rice planthoppers in Northern Lao." Seiji Tamotsu et al ,Kyushu Plant Protection Res., 54:51-55(2008)

In 2010, JICA
Cambodia
assisted the
Cambodian
Government to
Produce a
Booklet to
control the
Banned
Pesticides.



No Illegal Pesticides in the Market!

- Methyl parathion which was used to be found in the market with the trade name, "Folidol" have completely disappeared !
- Also, Methamidophos under the trade name, "Monitor" was not found in the market when I did survey in July, 2011, together with the member of CEDAC, an NGO promoting organic farming.

Methyl parathion(Folidol), Methamidophos(Monitor), Phosdrin etc.,were sold in Cambodian Market(2000)



Dinotefran, made in Japan(Mitsui Chemicals) Neonicotinoid "OSHIN", sold in Cambodia(July 2011)



Japanese Scholars to be included in the Task Force of IUCN

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