

Susceptibility to insecticides of brown planthopper *Nilaparvata lugens* in the lower Yangtze Valley

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Adult brown planthopper (BPH) *Nilaparvata lugens*, more than 50 females of each population, have been collected from rice fields of Anqing (Anhui Province) and Yangzhou (Jiangsu Province) and multiplied with rice in the laboratory at 25°C, 16 hours photoperiod since 1989. Assays were conducted using female adults of F₂-F₃ within 5 days after emergence by the topical treatment method. Technical grade insecticides were dissolved in analytical grade acetone and five or more diluted concentrations were prepared. For each concentration, 50 macropterous females were treated with 0.05µL of solution applied by micro-syringe on the thoracic dorsum.

Monitoring was done 48 hours after treatment. Dose-mortality regressions were estimated by probit analysis. LD₅₀s were considered to be indicative of resistance and their differences among years were tested by t test. The formula used was:

$$t = \frac{m_1 - m_2}{\sqrt{s_{m_1}^2 + s_{m_2}^2}}$$

where $m_1 = \log LD_{50}$ and $s^2 m_1$ or $s^2 m_2$ is the variance of m_1 or m_2 , respectively. If t is >1.96 or <-1.96 , there is significant difference between m_1 and m_2 .

The results are shown in the table. Although LD₅₀s fluctuated among years, resistance ratios varied little when compared with those in 1995. The reduction of the dosage of conventional insecticides applied to BPH in recent years has resulted from the wide application of buprofezin and of rice varieties resistant to BPH.

Wang Yinchang, Li Guoqing, Deng Xihua, Din Shiyin, Su Jiankun. 1997. Susceptibility to insecticides of brown planthopper *Nilaparvata lugens* in the lower Yangtze Valley. International Rice Research Notes 22 (2) 41-42.

See table below

Variation in susceptibility of BPH to insecticides. China, 1991-95.

Insecticide	Parameters a	Anging					Yangzhou		
		1991	1992	1993	1994	1995	1992	1994	1995
		Y-666	LD ₅₀ (µg/ head)	0.12	0.09	0.07	0.07		
	X ² value	6.28	3.65	1.56	1.46				
	Slope	1.49	1.87	0.38	5.78				
	t value**	3.81	2.59	0.88					
DDVP	LD ₅₀ (µg/ head)	0.05	0.04	0.04	0.05	0.07	0	0	0
	X ² value	1.97	0.42	2.06	1.58	0.84	6.9	3.18	4.63
	Slope	1.45	1.51	1.8	1.48	1.23	2.87	2.32	2.19
	t value**	3.29	3.75	4.09	2.3		3.27	1.23	
Monocrotophos	LD ₅₀ (µg/ head)	0.02	0.01	0.02	0.02	0.02	0	0	0
	X ² value	1.38	0.11	0.2	0.09	0.29	3.59	0	0.07
	Slope	1.49	1.45	1.4	1.5	1.5	2.36	2.07	1.66
	t value**	0.44	0.94	0.02	0.3		3.32	1.25	
Methyl parathion	LD ₅₀ (µg/ head)	0.1	0.05	0.06	0.05	0.06	0.08	0.04	0.05
	X ² value	3.56	1.13	0.47	1.01	0.76	6.13	5.68	2.24
	Slope	1.93	1.49	1.5	1.58	1.23	1.88	2.07	1.86
	t value**	3.65	1.62	0.39	2.01		4.5	0.7	
Parathion	LD ₅₀ (µg/ head)	0.21	0.11	0.15	0.15	0.13			
	X ² value	1.65	0.4	1.15	1.26	2.26			
	Slope	1.32	1.35	1.36	1.53	1.56			
	t value**	3.51	1.4	0.82	1.13				
Fenitrothion	LD ₅₀ (µg/ head)	0.11	0.06	0.07	0.06	0.06			
	X ² value	1.47	1.29	0.33	1.58	0.24			
	Slope	1.18	1.42	1.36	1.38	1.13			
	t value**	3.59	0.18	0.44	0.41				
Methamidophos	LD ₅₀ (µg/ head)	0.04	0.05	0.05	0.06	0.06	0.01	0	0.01
	X ² value	5.81	2.4	1.84	0.54	0.81	1.32	3.49	0.66
	Slope	1.53	1.92	1.71	1.69	1.52	2.9	2.15	2.11
	t value**	4.22	2.51	1.83	0.71		0.88	1.34	
Isoprocarb	LD ₅₀ (µg/ head)	0.05	0.04	0.05	0.05	0.04	0.01	0.01	0.01
	X ² value	0.78	2.38	2.46	2.47	3.77	0.96	1.13	1.19
	Slope	1.28	1.45	1.5	1.46	1.5	2.78	2.34	1.99
	t value**	1.79	0.5	1.54	1.46		2.84	3.28	
Carbaryl	LD ₅₀ (µg/ head)	0.04	0.03	0.04	0.03	0.03	0.01	0.01	0.01
	X ² value	3.57	1.88	1.3	6.76	0.87	6.17	5	5.48
	Slope	1.38	1.47	1.59	1.62	1.5	2.37	2.4	2.2
	t value**	2.33	0.96	1.36	0.03		2.85	0.74	
BMPC ^{b/}	LD ₅₀ (µg/ head)	0.11	0.04	0.05	0.05	0.05	0.01	0.01	0.02
	X ² value	2.74	2.78	0.62	0.98	0.37	2.12	1.38	0.15
	Slope	1.93	1.57	1.67	1.68	1.49	1.78	2.1	2.39
	t value**	6.14	1.15	0.58	0.72		2.68	1.6	
Carbofuran	LD ₅₀ (µg/ head)		0.01	0.01	0.02	0.01			
	X ² value		5.02	2.14	1.72	0.01			
	Slope		1.1	1.72	1.82	1.79			
	t value**		1.99	0.36	0.83				
Fenvalerate	LD ₅₀ (µg/ head)	0.14	0.06	0.06	0.07	0.08			
	X ² value	0.71	0.38	0.23	5.78	1.48			
	Slope	1.25	1.26	1.36	1.36	1.29			
	t value**	4.23	1.46	1.16	0.23				
Deltamethrin	LD ₅₀ (µg/ head)	0.1	0.04	0.05	0.05	0.05			
	X ² value	1.95	0.4	0.62	1.65	1.1			
	Slope	1.12	1.17	1.35	1	1.34			
	t value**	4.23	1.46	1.16	0.23				
Buprofezin	LD ₅₀ (µg/ head)		0.02	0.01	0.02	0			
	X ² value		0.72	1.3	0.8	0.06			
	Slope		1.08	1.47	1.82	1.13			
	t value**		7.72	8.08	7.75				

^{a/} LD₅₀s of Y- 666 in other years compared with 1994 data. LD₅₀s of other insecticides compared with 1995 data.

^{b/} A native insecticidal mixture, mainly composed of 3,5-and 3,4-dimethylphenylcarbamate