Prediction of the occurring amount of whitebacked planthopper (WBPH) on early rice by sea temperature

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Whitebacked planthopper (WBPH) is a kind of long–distance migratory pest. Its occurring amount is closely related to the climate change of large sphere. In recent years many researches have reported that the climate of large sphere was affected by the Pacific sea temperature (ST). We studied the long–range forecast of the occurring amount of WBPH by using data provided by State Meteorological Administration, China.

Taking the highest amount per 100 hills in main injurious generation of WBPH on early rice in Ganzhou Prefecture, Jiangxi Province as the object of forecast (y), and dividing y into six grades, i.e. 1–6 grades means the sequence of 1,000, 1,001–3,000, 3,001–5,000, 5,001–10,000, 10,001–20,000, and over 20,000 heads in order.

Three regions were selected from the 286 grid points in the northwest Pacific. Region A was the maritime space between Black Tide Region and California Cold Flow Region, 160 ° E – 130 ° W, 10 – 50 ° N. Region B was Black Tide Region, 125–180 ° E, 15–30 ° N, Region C was the east Pacific near the equatorial area , 180–85 ° W, 10 ° N– 10 ° S. Choosing the close order of Чебыщев(C) Polynomial in the direction of x and y in region A to be " 5, 6", B" 4, 3", and C" 6, 3". Having expanded the departure fields of sea temperature in three sea areas from Sep of the previous year to Apr of the year concerned by two dimension Чебыщев(C) Polynomial, 720 Чебыщев(C) Coefficients (CC) were obtained, among which 33 CC were significantly correlated to the object and as candidate for predictors.

Using stepwise regression analysis, the following two long–range forecast models were established:

I $\hat{y} = 5.3288 + 13.1439x_1 - 0.8650x_2$

II $\hat{y} = 5.5819 + 7.5865x_1 - 1.0864x_3$

Where x_1 was CC at grid point of "1, 3 " in region B in Oct of the previous year, x_2 and x_3 at " 0, 1 " in region C in Oct and Nov of the previous year, respectively.

Values derived from the two models fitted the actual values (see table) and no significant difference was shown [$t = 0.06$, DF = 9(1980–1989), $t_{0.05}(9) = 2.262$]. The models were also used to predict the occurring amount in 1990 and 1991. As a result, the predicting values agreed with the actual values unreservedly (1990) or basically (1991).

The occurring amount of *S. furcifera* from Jun to Jul could be predicted in Oct or Nov of the previous year by above models. This will provide sufficient time to make preparations for WBPH control.

Long–range predictive models of the occurring amount of WBPH

Year	Predictive value (grade)			Actual value (grade)	Error (grade)	t
	I	II	average			
1980	5.97	5.88	5.93	6	0.07	
1981	2.93	2.83	2.88	3	0.12	
1982	5.96	5.46	5.71	6	0.29	$t = 0.06$
1983	6.30	6.21	6.26	6	−0.26	<
1984	3.35	3.08	3.22	3	−0.22	$t_{0.05}(9)$
1985	4.09	4.28	4.19	4	−0.19	= 2.262
1986	5.71	5.70	5.71	6	0.29	
1987	6.05	6.25	6.15	6	−0.15	
1988	4.93	5.24	5.09	5	−0.09	
1989	3.73	4.07	3.90	4	0.10	