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The Relationship between Nitrogen Content in Soybean Leaves and Infestation Severity of *Aphis glycines* Mutsumura

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Abstract Changes in nitrogen content of leaves in different soybean species during the infestation by *Aphis glycines* Mutsumura was determined. A correlation between the nitrogen content of soybean leaves and infestation severity of *Aphis glycines* Mutsumura was found. Therefore, the nitrogen content of soybean leaves could be regarded as one of the ecological factors used in prediction of infestation severity of *Aphis glycines* Mutsumura.

Key words *Aphis glycines* Mutsumura, nitrogen content

Food is one of the most important ecological factors influencing survival, development and reproduction of the insect. Various kinds of nutrition have different effects on the insect. Moreover, insects have varying demands for different food. Nitrogen is one of the nutrients most needed by crops and insects. To know the influence of nutrients of different soybean species on the occurrence of aphids, the nitrogen content of soybean leaves and the occurrence of *Aphis glycines* Mutsumura were surveyed , and their correlation determined. The results were as follows.

1 Materials and methods

1.1 The survey of aphids in fields

The aphid number per 100 plants in different soybean species was surveyed in soybean fields of Jilin Agricultural University. The species of soybean came from Jilin No.21, Changnong No.4, Changnong No.5, Jilin No.20 and Jinong No.82. Sampling data was from June 20 to July 25 in 1991.

1.2 Determine of nitrogen content of soybean leaves

The aphids were collected in soybean fields on June 30, July 17 and July 25 in 1991. Five points were fixed with diagonal sampling for every soybean species. At each point three tender stems with three of the trifoliate leaves were selected from the tops of soybeans. After the samples were dried out, their full nitrogen content was determined by means of semi-microanalysis in KJELTEC Nitrogen Analyzers in a central laboratory of Jilin Agricultural University.

2 Results and analysis

The occurrence of aphids in different soybean species is listed in Table 1

Table 1 Infestation severity of aphids in different soybean species in fields (quantity per 100 plants)

Different species of soybean	Sampling date								
	Jun20	Jun25	Jun30	Jul 5	Jul 10	Jul 12	Jul 17	Jul 22	Jul 25
Jilin No.21	201	235	325	Rain	rain	1001	1400	rain	rain
Changnong No.4	580	610	972	Rain	rain	2200	2277	rain	rain
Changnong No.5	470	525	814	Rain	rain	1250	5607	rain	rain
Jilin No.20	1403	2316	2557	Rain	rain	4024	3340	rain	rain
Jinong No.82	330	1600	2196	Rain	rain	8390	16941	rain	rain

The nitrogen content of top leaves in different soybean species is shown in Table 2.

Table 2 Full nitrogen content of leaves in different soybean species (%)

Sampling date	Breed				
	Jilin No.21	Changnong No.4	Changnong No.5	Jilin No.20	Jinong No.82
Jun 30	2.527	4.484	4.679	3.294	5.021
Jul 17	3.863	4.643	5.095	4.848	6.373
Jul 25	2.861	4.084	3.744	4.417	4.014

The two tables show a change trend in aphid numbers on top of leaves per 100 plants consistent with that of nitrogen content of soybean leaves. From June 20 to July 17, the numbers of aphids and the nitrogen content of leaves show an upward tendency. In contrast, the aphid numbers and the nitrogen content had a downward tendency from July 17 to July 25. The statistical analysis shows there was a positive correlation between the full nitrogen content of top leaves and aphid numbers per 100 plants. X represents nitrogen content, Y stands for aphid number per 100 plants, and correlation analysis was performed. A linear regression equation of Y= -11118.93+3303.967X was obtained. The correlation coefficient was r =0.7438258. The t test for r was determined, t = 4.01258 ($t_{0.01}$=3.012), t > $t_{0.01}$. Therefore, there was a close positive correlation between the full nitrogen contents of top leaves and the degree of occurrence of aphids.

In addition, according to analysis of the data in the two tables, the nitrogen content of soybean leaves with larger aphid numbers per 100 plants was significantly higher than that with fewer aphid numbers per 100 plants. During the aphid outbreak dated July 17, the full nitrogen content of top leaves in Jinong No.82 was highest (6.374%). Meanwhile, aphid numbers per 100 plants was also the largest (16941). By contrast, for species of

Jilin No.21, the full nitrogen content was the lowest (3.863%) and the aphid number per100 plants was correspondingly lowest (140). Nevertheless, the nitrogen contents and aphid numberss of the other three soybean varieties were obtained between that of the Jilin No.21 and that of Jinong No.82.

The results indicate that full nitrogen content of top leaves is a food factor influencing the occurrence of *Aphis glycines* Mutsumura. However, the difference of full nitrogen content of top leaves in different soybean varieties would influence soybean resistance to aphids. Their significance needs to be further investigated. Consequently, full nitrogen content of top leaves could be recommended as an ecological factor in prediction of the degree of occurrence of *Aphis glycines* Mutsumura.

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