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Research Article

Effect of Botanical Insecticide of *Macleya cordata* on Physiology and Biochemistry of Cabbage (*Brassica oleracea* L.)

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Abstract: In order to improve the effect of Cyhalothrin and botanical insecticide of *Macleya cordata* in the *Brassica oleracea* L. investigated, the contents of proline, soluble sugar and soluble protein were determined. The results showed that under the stress of botanical insecticide of *Macleya cordata* at the same concentration, the contents of proline, soluble sugar and soluble protein were significantly lower than those with Cyhalothrin ($p<0.05$) except the proline content has not significant differences between Cyhalothrin and botanical insecticide of *Macleya cordata* with a dosage of 50×. The degree of damage with Cyhalothrin is greater than that of botanical insecticide of *Macleya cordata*.

Keywords: Biochemistry, *Brassica oleracea* L., *Macleya cordata*, physiology

INTRODUCTION

Chemical pesticides as an effective means of pest control play an important role in agricultural production, but large-scale use of chemical pesticides has also caused many negative effects (Liu *et al*., 2006). Studies have shown that adversity can lead to plant a series of physiological and biochemical indicators of change.

Such as the formation of stress proteins, increase in osmotic adjustment substances (such as proline content) and promoting the conservation of activity. Several studies have reported on chemical pesticides on plant stress (Qu *et al*., 2006; Zhang and Li, 2003; Jin-Cai *et al*., 2002, 2003; He *et al*., 2005; Peng, 2003), but the stress on plant physiological and biochemical research on botanical insecticides is rarely reported. The cordata *Macleaya cordata* (Willd.) R. Br alias horn rod, mountain horn, Papaveraceae perennial wild herb widely distributed in the Yangtze River in China (Zou and Long, 2009). Botanical pesticides Macleaya Alkaloids has to kill maggots, insecticidal, fungicidal, to rid the role of soil pests and overwintering eggs (Zou and Long, 2009; Wang, 2005) and their active ingredients easily degradable, efficient, non-toxic, non-polluting, has been widely used in various food crops pest control. In this study, by comparing the analysis of cabbage under pesticide stress, proline, soluble protein and soluble sugar changes to explore the botanical pesticides (Macleaya bio-pesticides) and chemical pesticides (cyfluthrin) Plant Physiology and Biochemistry the development and application of botanical pesticides in order to provide some reference.

MATERIALS AND METHODS

For test pesticides: Cyfluthrin (5% Cyfluthrin) were purchased from the farmers market in Anqing City; the *cordata* biological pesticides (1% *Macleya cordata* (willd) R.BR) Pesticide Co., Ltd. to provide robust by Anqing City.

For the test plant: College of Life Science, Botanical Garden spread of cabbage (*Brassica oleracea* L.), before testing, fertilizing, spraying, plants covering the top fine grid, insect feeding. Until the plants grow 4-5 leaves, select the same growing cabbage transplants and regular watering. A week after the 1st spraying (April 18), then spray every 2 days (April 21 and April 24) for three times. The two agents were 3 treatment, the concentrations were 50, 250 and 500 times, respectively. Another one is not spraying the blank control.

For the purposes of sampling time and sample pretreatment: Sampling, the last one day after the first spraying (April 25) after the first 5 days (April 29) and 10 days (May 4). To take the aerial parts of plants, sample three times in total. Each sample replicates three samples. Field to retrieve the samples with distilled water and air dry. Then it takes a certain weight of the sample processed according to test requirements.

Determination of: The free proline content was measured by using the sulfosalicylic acid extraction; the protein content was determined by Coomassie Brilliant Blue G-250 staining; soluble sugar content was determined by the anthrone colorimetric method (Xue *et al*., 2001).

Statistical methods: SPSS 11.5 statistical software is used to process the data. Data differences between each group using paired t test. All values of X±S.D., test level of significance set at ($p<0.05$).

RESULTS AND ANALYSIS

Insecticide stress on cabbage proline content: Table 1 shows that over time after treatment on day 1 and 5, after the first 10 days, the stress group and control group of proline content has gradually increasing trend and the stress group of proline content the control group. Control group increases slowly and has little changes. The two insecticides on cabbage have to stress the role of proline content after using has been greatly improved and stress the higher the concentration, the higher proline content within the organization. On the proline content of the *cordata* biological pesticides are less than the same concentration of cyfluthrin at 250× and 500× significant difference ($p<0.05$).

Insecticide stress on soluble protein content of cabbage: It can be seen from Table 2, after processing the first one for 10 days, cyfluthrin will be treated with different concentrations of chemical pesticides, the soluble protein content of the cabbage shows a trend first and then decrease and reaches the highest value in five days. Different concentrations of Macleaya biological insecticide-treated, soluble protein content of the cabbage first decreases and then increases. The blank control is a gradual downward trend. The soluble protein content, cyfluthrin shows obvious stress, compared with *cordata* biological pesticides, both in 50× 250× and 500× are significant differences ($p<0.05$).

Insecticide stress on soluble sugar content of cabbage: It can be seen from Table 3, the soluble sugar content over time, stress and control groups have the tendency to increase gradually and soluble sugar content is a higher stress group. Both stresses the role of two kinds of pesticides on the cabbage, the use of soluble sugar content has improved greatly and the higher the concentration, the higher the content of soluble sugar. Impact on soluble sugar content, the *cordata* biological pesticides are less than the same concentration of cyfluthrin and in 50× 250× and 500× are significant different ($p<0.05$).

Table 3 shows cyfluthrin and Macleaya's biological impact on cabbage soluble sugar content (ug/g).

CONCLUSION AND DISCUSSION

Proline is the most effective kind of affinity osmotic adjustment substances, whose quality will be directly related to the strength of the plants' stress resistance. Plants under normal conditions, low levels of free proline under stress, free proline content would accumulate a lot. The results of the rise (Sun *et al*., 2000; Akihiro *et al*., 2007; Ming-Sheng *et al*., 2003; Mao *et al*., 2005). Song Aijun effects of pesticides on Euonymus japonicus proline content show that the

Table 1: Effect of pesticides on or proline content in *Brassica oleracea* L. (ug/g) sampling

		Cyfluthrin the CK cyfluthrin macleaya bio-pesticides			Macleaya biopesticides		
The time	CK	50×	250×	500×	50×	250×	500×
1 day	17.58±1.63	33.54±2.21	30.00±1.60	26.13±0.79	31.45±3.18	20.58±1.19*	17.66±0.29*
5 days	22.29±0.86	42.71±1.71	30.67±2.24	27.88±0.68	36.95±2.25	28.70±2.09	24.00±0.87*
10 days	28.41±2.85	193.92±10.02	124.79±6.46	52.96±3.01	133.75±29.42	115.58±4.48	38.79±0.53*

*: Significant difference and cyfluthrin

Table 2: Effect of pesticides on of soluble protein content in *Brassica oleracea* L. (ug/g) sampling

		Cyfluthrin the CK cyfluthrin macleaya bio-pesticides			Macleaya biopesticides		
The time	CK	50×	250×	500×	50×	250×	500×
1 day	2.82±0.20	1.94±0.45	0.89±0.13	0.93±0.29	1.33±0.06	2.97±0.21*	1.36±0.10
5 days	0.65±0.04	2.39±0.29	2.92±0.46	3.08±0.21	0.98±0.08*	0.93±0.10*	0.67±0.22*
10 days	0.70±0.03	0.85±0.08	1.15±0.11	0.47±0.01	1.17±0.11*	1.24±0.02	0.99±0.20*

*: Significant difference and cyfluthrin

Table 3: Effect of pesticides on of soluble sugar content in *Brassica oleracea* L. (ug/g) sampling

		Cyfluthrin the CK cyfluthrin macleaya bio-pesticides			Macleaya biopesticides		
The time	CK	50×	250×	500×	50×	250×	500×
1 day	3.17±0.32	19.44±3.14	13.93±1.98	5.91±0.63	5.53±0.79	4.68±0.36*	3.49±1.43*
5 days	28.37±5.87	80.27±2.27	70.95±1.88	60.39±2.49	60.03±2.27	51.10±3.17	38.72±7.58*
10 days	72.18±6.70	109.31±15.01	98.49±8.57	85.75±11.57	88.81±8.36*	69.56±2.40	68.33±10.20*

*: Significant difference and cyfluthrin

pesticide treated Euonymus japonicus proline content is significantly increased than in the control plants. This is consistent with the findings of the experiment. The tests show that the pesticides and drought, high and low temperature plants are the stress factors and two insecticide-treated cabbage proline contents are to improve its content. The chemical pesticides cyfluthrin will fall back to the bio-pesticides and both are in various concentrations with significant differences.

Changes in plant cells, proteins are the main changes in soluble proteins and enzymes. Most of the plants of the soluble protein are involved with various metabolic enzymes and to measure its content is an important indicator to understand the plant metabolism. A variety of stress factors (such as heat, hypoxia, low temperature, pathogens, high salt, drought, heavy metals, reactive oxygen stress, etc.) inhibit the normal protein synthesis in plants, induces the synthesis of new proteins, or the original protein synthesis has been found increasing in the phenomenon (Xu *et al*., 2008; Cui *et al*., 2011; Zou *et al*., 2009; Fang and Dong, 2010; Shi *et al*., 2010; Zhang, 1999). The plants under stress conditions increased the synthesis of soluble protein, directly involved in the process of resilience. Its adaptation to adverse environmental conditions is of positive significance. This test has shown that the stress under different concentrations of cyfluthrin in the 1 to 10 days of treatment, the cabbage protein content shows a decreasing trend after the first and the first five days the protein content is the highest. Cabbage' adaptation to stress and protein synthesis reaction are most intense when 5 days reached, subsequent synthesis reaction by the different levels of suppression, persecution phenomenon gradually shows enhanced protein degradation. Different concentrations of Bo to fall back to the biological insecticide-treated, soluble protein content of the cabbage first reduced and then increased. The blank control was a gradual downward trend. Table Invention falls back to the biological insecticide-treated; the protein content of the cabbage has no significant effect.

Plant soluble sugar is a product of photosynthesis under stress conditions osmolytes and protective substances, adversity and its content will be increased to different degrees. Plants under stress conditions in the face of adversity, the soluble sugar content increased on the cell membrane and protoplast has a protective effect, but also plays the role of protective enzymes. Shi *et al*. (2010) studied its physiological and biochemical indicators on different wheat seedlings under salt stress, results show that salt-tolerant line of wheat varieties of soluble sugar content was always higher than the weak varieties of salt tolerance. Zhang (1999). Shown that under salt stress, the soluble sugar content of wheat seedlings increased. Ho Hing loves pepper materials, two pesticide omethoate and abamectin as a stress factor, results show that the Shia Wei streptozotocin and omethoate 1 to 14 days after treatment spray pepper soluble sugar content of almost than the control value. From the results of this experiment, two insecticides on cabbage are stressed, the use of soluble sugar content has been greatly improved and the higher the concentration, the higher the content of soluble sugar. The same concentration of chemical pesticides cyfluthrin on cabbage soluble sugar content is greater than botanical pesticides Bo fall back to the biological insecticide and were significant different between each concentration.

In summary, a certain concentration of chemical pesticides cyfluthrin stress can prompt proline. Botanical pesticides have more advantages than chemical pesticides on plant physiological and biochemical processes has accelerated the development of biological control. It is an important part of botanical pesticides which can ensure the sustainable development of agriculture. The pesticide industry has broad prospects in the future.

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