2. The cyclic character as a universal regularity of the development process explains the recurrence of the mass reproduction of harmful insects and serves as a criterion for their forecasting.

3. The theory of the population dynamics cyclic character performs the descriptive, explanatory, prognostic and synthesizing functions. Through the law of cyclic character it combines the previously proposed theories, i.e. the climatic and trophic ones.

4. An intersystem method for a lon-term forecast of the mass reproductions of insects as well as the algorithms for their forecasting have been developed on the basis of the theory of the population dynamics cyclic character.

In the last decade an ecological and genetic theory explaining the mechanism of the dynamics in the number of the phytophagous insects (Chaika, 2000) and a phenological theory explaining the difference in the dynamics of populations of the individual species of pine and leaf-gnawing insects and their synchronism with the fodder plants and entomophages (Meshkova, 2009) have been substantiated in Ukraine. The above-mentioned theories are widely discussed in the entomological literature.

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RESEARCH PROGRESS OF ATRAZINE HERBICIDE RESIDUES

Triazine herbicide atrazine is a selective internal absorption conduction type pre and post seedling herbicide, which can effectively control annual grass weeds and broadleaf weeds, and also has a certain inhibition effect on some perennial weeds (Francis,1970). At present, it is mainly used for corn, sorghum, sugarcane, fruit trees and forest land in China, It can also be used as a non-selective herbicide on non-farm land and fallow land, atrazine has been widely used because of its excellent herbicidal effect and low price. After application, atrazine parent and its degradation products can remain in the soil for several years, which will cause pesticide

damage to sensitive crops in the following crops and affect the normal rotation. Because atrazine has high mobility in the soil, especially in the soil with low organic matter and clay content, it can pollute groundwater and surface water through leakage, leaching and surface runoff (Liu,2004). Therefore, a rapid, effective and accurate analysis technology is urgently needed in production to determine the residual concentration of atrazine in soil and its impact on sensitive crops in the following crops, so as to provide guidance for the correct use of atrazine in agricultural production and reasonable rotation.

At present, there are many reports about atrazine residue detection. In 2003, W.Xie reported that, established a reversed-phase high performance liquid chromatography method to analyze atrazine pesticide residues in soil and water, the recovery rates of atrazine at different levels of addition in soil and water were 87.0%–93.3% and 97.3%–103.2%, respectively, between 80%–120%, by HPLC with equal gradient elution technology, the minimum detectable amount of atrazine was 0.01 ng, and the minimum detectable concentrations of atrazine in soil and water were 1.5 ng/g and 0.03 respectively μg / l level. Due to the use of water extraction and solid-phase extraction technology, the amount of organic reagent used in the whole pretreatment process is only a few milliliters, which is suitable for monitoring atrazine pesticide pollution in the environment (Xie et al., 2003). In 2018, B. Wang reported that, established a high-performance liquid chromatography-mass spectrometry/mass spectrometry method to detect atrazine residues in corn plants, and found that the average recovery rate of atrazine was 81.8% - 106.9%, and the relative standard deviation was 1.3% - 6.0%. This method is simple and fast, with sensitivity, accuracy and precision meeting the requirements of pesticide residue analysis, and has strong feasibility in actual detection (Wang et al., 2018); In 2021, W. Liu used the accelerated solvent extraction method to extract trace atrazine residues in soil, and the gas chromatography electron capture detector method to quantitatively detect the analytical method, the results showed that the concentration range of atrazine was 0.01–8.0g/ml, and the linear relationship was good, and the correlation coefficient was not less than 0.995, the detection limit is 0.006–0.010 mg/kg; The recovery rate of spiking is 84.1%–92.3%; The repeatability RSD is 2.85%. This method is fast, reagent free and pollution-free (Liu, 2021); In the same year, J. Wang et al. Detected atrazine residue in water by liquid chromatography, the sample recovery was 94.7%, and the relative standard deviation was 5.1%, which met the quality control requirements. In 2022, N. Zhong et al. used

ultra-high performance liquid chromatography tandem mass spectrometry to detect atrazine residues in maize and plants, the test found that the recovery rate of atrazine in maize and plants was 74.2%–105.5%, and the relative standard deviation was 2.8%–14.8%. This method had good separation and purification effect, simple operation, and the accuracy and precision could meet the requirements for residue detection (Zhong et al., 2022);

The experimental study found that atrazine residues in Henan Province, a large agricultural province where economic crops such as corn, wheat and sorghum are widely planted, have caused harm to varying degrees. The corn planted in Xinxiang City, Henan Province was extracted with suitable solvents, and then purified by column chromatography, and finally the final residue of atrazine in corn grains was determined by GC. The results showed that when the concentration of atrazine in corn grains was 0.005–0.5 mg / kg, the average recovery was 78.81%–94.01%, and the RSD was 0.91%–6.32% When the low dose of 1110g / hm^2 and the high dose of 1665g/hm^2 (effective ingredient dosage) were applied once, atrazine residues in corn seeds were lower than MRL (maximum residue limit of pesticides).

The long residue herbicide atrazine is widely used in crop production because of its wide spectrum of herbicides and excellent herbicidal effect. However, the adjustment of planting structure is seriously affected due to the toxic effect on the following sensitive crops. Henan Province is a big agricultural province, and it is also a big application province of this type of herbicide. Therefore, it is of great significance to study and use the biodegradation of long residue herbicide atrazine to solve the toxicity of long residue herbicides to subsequent sensitive crops and extend the service life of such herbicides, so as to ensure the safety of crop production and the sustainable development of agriculture.