**Scholars Journal of Agriculture and Veterinary Sciences** **e-ISSN 2348–1854**
Sch J Agric Vet Sci 2016; 3(5):389-394 **p-ISSN 2348–8883**

(An International Publisher for Academic and Scientific Resources) DOI: 10.36347/sjavs.2016.v03i05.007

# Risk regulation in the application of the pesticide residue standards- A case study of Chinese tea

**Yanjie Zhou**
School of public management and politic science and law, Southwest Jiao Tong University, Chengdu 610031, China

***Corresponding Author**
**Name**: Yanjie Zhou
**Email:** 773471847@qq.com

**Abstract:** Tea is one of the three drinks in the world, and having a variety of health benefits. With the widespread use of pesticides in tea cultivation, it was increasing production and reducing disease, but also led to the quality of tea contaminated. Given pesticide residues may affect human health, countries began to develop pesticide residue standard for tea, and the standard is one of the measures of risk regulation. This paper reviews the Chinese tea in pesticide residues risk regulation situation, and with the CAC, the EU, the United States to do comparative analysis found that: (1) States to establish limits need to consider the factor of trade barrier; (2) principle of cautious prevention can influence the risk of regulatory development will be; (3) countries' regulatory decisions will also affected by the perception of risk culture.
**Keywords**: Risk regulation, Pesticide residues Tea

## Introduction

Tea is a traditional Chinese industry, is one of the Chinese export products. Chinese tea has extensive origin, great variety, diverse tea processing and other characteristics, planting area accounts for about 50% of the world's total area, production accounts for about 31% of world production, is the world's largest tea producer, is also a major tea exporter.

**Table 1: China tea export volume, export value and export price changes in recent five years (Unit: million tons, million dollars, dollars / ton)**

| Year | Export volume | Export value | Export price |
|---|---|---|---|
| 2009 | 30.29 | 70494.72 | 2327.327 |
| 2010 | 30.25 | 78414.46 | 2592.214 |
| 2011 | 32.25 | 96508.01 | 2992.496 |
| 2012 | 31.34 | 104211.56 | 3325.193 |
| 2013 | 32.58 | 124630.78 | 3825.377 |

Source: United Nations Trade Database(comtrade.un.org)。

The active ingredient in tea can enhance the immunity, anti-aging, radiation, fatigue, lower blood pressure, blood lipids, blood glucose and other health effects. Therefore Chinese are very fond of tea, in addition, more than 160 countries or regions like Britain, the United States also have the habit of tea consumption. However, pesticide residues, heavy metals, microorganisms and other factors in tea will pollute its quality, those will not only affect the health benefits of tea, but also will give the health risks. A scholar has pointed out that the reasons of affect safety and quality of tea the pesticide residues occur 80%[1] .

In recent years, many scholars have discussed about the hazards of pesticide residues in tea for the human body, to avoid health risks may caused by pesticide residues in tea overweight, countries began to develop the corresponding pesticide residue limits, and Chinese tea has been repeatedly reported that excessive pesticide residues and export tea be returned, many scholars believed this is the reason of green trade barriers, then explored and written the reasons, mechanisms and the role of impact on Chinese Tea export of the barriers[2-5]. This paper compared and analyzed difference among the Codex Alimentarius Commission (CAC), the European Union and the United States standards for pesticides residues in tea risk regulation on the institutional, legal measures way ,and we found: the European Union and other organizations or countries, their pesticide residue risk regulation is stricter than China, not only It is determined by factors of trade barriers, also affected by the risk of cultural awareness and the precautionary principle.

**The analysis of Pesticide residues risk regulationin tea**

Risk regulation is a kind of social regulation, public institutions assess and monitor the possible risks, through the development of regulatory standards, monitoring the implementation and other means to eliminate or mitigate risk[6]. The fundamental purpose is to eliminate or reduce the risk probability, guarantee the quality of the living environment and public safety. Regulatory measures generally included the establishment of high-quality personnel, professional management agencies, using the scientific risk assessment principles to develop the standards, and the enactment of mandatory legal provisions.

Chinese tea is generally distributed in subtropical and warm temperate regions, warm and humid ecological conditions is the breeding ground for weeds and pests , so pesticide residues is inevitable[7]. The residues is divided into two sources, the direct pollution is all kinds of chemical pesticides for cropping; Indirect pollution constitutes by three reasons: (1) the roots absorb the pesticide in the soil for spraying and then transport to tea leaves;(2) spraying and irrigating water contains pesticides transferred to the tea trees;(3) after spraying the pesticides volatile molecules into the atmosphere or absorb the atmospheric dust gradually settling, or pouring down rain pollution tea[8].

Because impacted by natural conditions and agricultural technological development , the quality and safety of Chinese tea, especially pesticide residues by the concern and controversy around the world , how to regulate pesticide residual risk of tea , and to meet national demand, international change is the most important issue of Chinese tea industry, so this paper aimed the two requirements to do the following comparative analysis.

**Comparison of Chinese and foreign pesticide residues standards**

Pesticide residues standard is the basis of food hygiene and safety department for food market supervising, also the base for consumers complaints[9]. In this paper, we considered the national standards is more representative and compulsory than industry-standards, more in line with standards-based regulation, so we selected Chinese "GB 2763-2014 Maximum residue limits for pesticides in food" as the comparison standard, mainly from the two aspects of coverage and rigor compared with CAC, European Union, United States.

First, on the coverage of pesticides, Chinese tea standard is too broadly, only defines the pesticide residue indicators of tea; EU limits' category of tea include in tea stems, fermented tea or other camellia extract; American classed tea into tea (dry), picking tea leaves, tea crop refined oil, boiled eggs, etc; in the CAC standard tea is divided into tea, green tea, black tea, another fermented tea and dry tea points.

Secondly, the gap between the number of indicators of tea. Chinese tea pesticide residual standard only had 28 indicators, EU has reached 454, the United States was 23 , CAC was 16 .

Finally, to compare countries standards' the degree of strict and differences in maximum residue limits ,we regarded Chinese standard' each pesticide as the basic of limits, and used a fraction to express the differences in EU, US, CAC residue limits ,results as follows:

**Table 2：Domestic and international tea pesticide residue limits for index comparison (Unit：mg/kg)**

| | Standards / pesticides | GB 2763-2014 | UN' Standard | USA' Standard | CAC' Standard |
|---|---|---|---|---|---|
| 1 | Endosulfan | 10* | 3 | 12/5 | 1 |
| 2 | Cypermethrin | 20 | 1/40 | 1/50 | 3/4 |
| 3 | Buprofenzin | 10 | 1/200 | 2 | 3/2 |
| 4 | Glyphosate | 1 | 2 | 1 | — |
| 5 | Fenitrothion | 0.5* | 1/10 | 1 | — |
| 6 | Permethrin | 20 | 1/200 | — | 1 |
| 7 | Deltamethrin | 10 | 1/2 | — | 1/2 |
| 8 | Thiamethoxam | 10 | 2 | — | 2 |
| 9 | Bifenthrin | 5 | 1 | — | 6 |
| 10 | Difenoconazole | 10 | 1/200 | — | — |
| 11 | Diflubenzuron | 20 | 1/200 | — | — |
| 12 | Flucythrinate | 20 | 1/200 | — | — |
| 13 | Cartap | 20 | 1/200 | — | — |
| 14 | DDT | 0.2 | 1 | — | — |

Note: The above information is derived and analyzed by the author.

The above table shows that the standards difference has two main aspects among China, CAC, UN, and the United States:

**CAC's, the UN's and the United States' part of pesticide residue standards are more stringent than Chinese.**

(1) Chinese tea pesticide residue limit has 26 indicators coincides with the EU, but most of the EU' indicators are strict standards than Chinese, especially on pesticide of difenoconazole, diflubenzuron, fluorine fenvalerate, permethrin and cartap , Chinese limit indicators are the EU's 200 times .

(2) Chinesetea pesticide residues limited indicators consistent with the United States, such as fenitrothion , both of two countries are 0.5 mg / kg. The United Statesonly has two residue index that are stricter than Chinese: cypermethrin, cyhalothrin, and cypermethrin indicator is Chinese 1/50 times.

(3)China only has seven pesticide residue index coincide with CAC's standard: fenpropathrin, endosulfan, permethrin, cypermethrin, bifenthrin, deltamethrin, thiamethoxam, except for the indicators of deltamethrin and cypermethrin chineseis looser (is 1.33 times of CAC's), China basically achieved the CAC's standard, and even more stringent.

(4) EU standards significantly stricter than any other organization or national standards, such as buprofezin, Chiese, the United States's and the CAC's were 10 mg/kg, 20 mg/kg and 15 mg/kg, but the EU's indicator is 0.05 mg/kg, is Chinese 1/200 times , the United States' 1/400 times and with the CAC's1/300 times.

**China some limited indicators are more stringent than the EU's, the United States', the CAC's standard**

(1) Such as fenvalerate, it is the banned pesticidein Chinese standard, significantly stricter than the EU's 0.05mg/kg. Also on the MRLs indicators of thiamethoxam, the EU's and the CAC's standards are 20 mg/kg, which is Chinese 2 times .

(2) The residues indicator of Endosulfan , the EU's, the US's index are 30 mg/kg, 24 mg/kg, Chinese and the CAC's are 10 mg/kg, the EU's and the United States' are Chinese Index 3 fold and 2.4-fold.

(3) The United States and the CAC set dicofolindex maximum residue levels to 50 mg/kg, China and the EU ban on the use of it, stricter than the United States' and CAC's standards. Meantime, Chinese and EU standards are the same on bifenthrin indicator, CAC's is six times of the Chinese and the EU's.

**Gap Analysis**

The main reason for Chinese, the EU's, the US's and the CAC's standards differences are different risk control rules adopted. EU adopts totally zero risk system, is the organization of the highest update pesticide residue standards in the world[10]; CAC's principle is: only identify a pesticide residue intake exceeds a certain limit and the body will cause harm to the inclusion criteria, while make sure that no harm or uncertainty is not included in the standard; the United States has adopted the FAO s and risk assessment principles, only made 23 kinds of pesticide residue limits requirements of tea , but its use is not listed and the lowest limit of detection, still stricter than Chinese; China is only actively with international practicein recent years , the reference standard or CAC adopted its pesticide residue risk assessment data.

**Comparison of the risk of pesticide residues regulatory organizations between Chinese and foreign**

Comparison of risk regulation mechanism

Chinese pesticide residue limits in food provisions, inspection methods and procedures by the health administrative department, agriculture administrative department of the State Council. National Food Safety Commission and the National Standards Committee on Food Safety responsible for pesticide residues Planning and reviewing in national standards, Pesticide Residues Standards Committee is primarily responsible for residual risk pesticide monitoring, assessing and communicating, and Food Safety Pesticide National Standards Review Board residual points Authority to fulfill common pesticide residue standards review.

CAC pesticide residue limits set by the Codex Committee on Food Pesticide Residues (CCPR) , it according to reliable toxicological evaluation of pesticide residues and evaluate the results of risk assessment, etc., through data analysis and deduction to assess security risks, to explore, to develop food pesticide maximum residue limits (MRLs) standard. Joint Meeting on Pesticide Residues (JMPR) conducted in accordance with CAC and CCPR recommendations pesticide residue risk assessment, provide assessment results for the assessment of risk management institutions, advice and technical support[11].

DGXXIV is EU's pesticide Residues administrations, Food and Veterinary Office (FVO) in charge of agriculture, veterinary medicine and chemical contaminants residues monitoring the development and urged Member States to develop annual residue monitoring plan[12]. European Food Safety Authority (EFSA) is responsible for developing unified pesticide residue limits, according to the toxicity of pesticides and assessment of dietary habits of Europeans of different drug on consumer safety. European Tea Committee (ETC) to coordinate the EC countries tea

quality indicators and health indicators analyzed outside inspection and to develop standards and a variety of pesticides in tea MRLs[13].

US's pesticide residue standards set by the US Environmental Protection Agency (EPA) the Food and Drug Administration (FDA) is responsible for the import and export of other goods traded across state pesticide residue testing, the US also established a relatively perfect pesticide residue standards , management, inspection, testing and information dissemination mechanism[14].

Compare Conclusions:

The risk of regulatory agencies should have the ability to establish a risk monitoring system, a reasonable allocation of resources to reduce risk. The EU, the United States for their own specific national conditions, scientific managed pesticides residual risk, including the establishment of independent regulatory agencies for pesticide residues, strictly follow the scientific risk assessment data to develop pesticide residue standards. But China did not improve the regulatory system and professional independent regulatory agencies, and the lack of rational risk regulation arrangements, usually in a passive state, risk regulation by developed Forced then.

**Comparison of the domestic and international laws of pesticide residues**

**The legal system comparison:**

The EU for food and agricultural safety management adopted a unified legislative style. After a large number of food safety crises outbreak, such as mad cow disease, in order to restore the credibility of the government and to reduce the loss of trade, the European Commission issued 178/2002 / EC Regulation "Food Safety Basic Law" in 2002, established a "from production to table" chain management institutional framework, and developed a unified system of legislation, regulations, standards, systems, and on the basis of legislation on pesticide residues management regulations profound changes, and in September 2009 the formal implementation of the unified management of pesticide residues in the legal system.

The United States is earlier country in the pesticide legislation[15] in the federal law, with respect to pesticide management including the "Federal Insecticide, Fungicide, and Rodenticide Act" and the "Federal Food, Drug, and Cosmetic Act," . To avoid the use of pesticides threatens the survival of endangered populations or alter habitats of endangered populations enacted a "bill of pesticides and endangered populations." The United States as early as 1987 on specially formulated "tea import bill," provides that all the tea into the US market, are not less than the minimum standards established by the US Committee of Experts on tea. At the same time, "Food, Drug and Cosmetic Regulations" requires various types of tea before entering the US market must pass through US Department of Health Human Services, Food and Drug Administration sampling, qualified before they can enter the US market.

China promulgated the law for pesticide management is limited to the administrative regulations level, the force is less than law, such as the "People's Republic of China Pesticide Management Regulations", "People's Republic of China Agricultural Product Quality Safety Law". Although both of them are relevant provisions, but not for pesticide management and tailor-made targeted is not strong, the coverage is not extensive; the new "food safety law" (2015) fishes pesticide management made more stringent provisions of highly toxic, highly toxic, high residue pesticide to do the relevant provisions.

The conclusion of the study:

The EU and the United States based on the importance of quality and safety of agricultural products , carried out the reform of food safety regulation and food safety laws, and improved the standard system. The establishment and improvement of pesticide legislation also promote the appropriate management of pesticide residues and therefore to the risk of pesticide residues made reasoned legal regulation. And China is lack of the law at the national level on Pesticide Management. Also did not issue specific legislation on tea, therefore tea production and the process of the prohibited can not limit the illegal act, also can not guarantee the quality and safety of tea from a legal perspective.

**The influence factors of tea pesticide residue risk regulation between Chinese and foreign analysis**

Standards as a relatively higher degree of intervention in the form of risk regulation, plays an important role in the regulation[16]. Its formulation first thing is considering food safety and public health, under the premise of fully protect the safety, also considering national conditions, to promote the continuous development of the industry, so the main factors of standards are few points:

**Trade Barriers**

The CAC, European Union, the United States in order to protect the safety and quality of tea and orderly trading, establish the pesticide residue maximum limits for tea. In every country or organizational standards, the limits will certainly in different level between the tea producing and consuming countries, such as the considerations of trade protection and other aspects . For example, the most stringent standards of the European Union, as of April 2014, the EU regulations for pesticide residues in tea MRL has reached 454, only in 2013-2014, the EU total update the index more than 30 amendments.

**Table 3：The EU revised and updated parts of the tea pesticide residue limits in recent two years (Unit: mg/kg)**

| Pesticides | Original MRLs | Current MRLs | Effective Date | File Source |
|---|---|---|---|---|
| Fenitrothion | 0.5 | 0.05* | 2013/4/26 | Reg.(EU) NO 899/2012 |
| Tridemorph | 20 | 0.05* | 2013/4/26 | Reg.(EU) NO 899/2012 |
| Pentachloronitro-benzene | 0.05* | 0.1* | 2013/4/26 | Reg.(EU) NO 899/2012 |
| Propargite | 5 | 0.05 | 2013/4/26 | Reg.(EU) NO 899/2012 |
| Thiamethoxam | 0.1 | 20 | 2013/6/5 | Reg.(EU) NO 500/2013 |
| Profenofos | 0.1* | 0.05* | 2013/9/1 | Reg.(EU) NO 899/2012 |
| *2,4*-DB | 0.1* | 0.05* | 2014/2/2 | Reg.(EU) NO 668/2013 |
| Bacteria | 0.1* | 0.05* | 2014/6/6 | Reg.(EU) NO 1138/2013 |
| Dodine | 0.2* | 0.1* | 2014/6/6 | Reg.(EU) NO 1138/2013 |
| Fluoro-butyryl alachlor | 0.1* | 0.05* | 2014/7/6 | Reg.(EU) NO 1137/2013 |
| Metolachlor | 0.1* | 0.05* | 2014/7/6 | Reg.(EU) NO 1137/2013 |

Note：*indicates a limit of detection

This table is enough to show the EU's standards speed of revising and updating and quantity, a closer look is easy to see the EU's tea limits is aganist to Chinese[17], the main reasons:(1) for not registered pesticide the UN take all limits (0.01mg / kg), but the standard has not been a risk assessment, such as pesticides azole insect amides , limited indicators of 0.01mg/kg, prompting some Chinese tea companies have been informed[18]; (2) for the country or not mainly rely on imports crops to develop more stringent standards, such as pesticides chlorantraniliprole, in the European grape limit is 1 mg/kg, but in tea is 0.02mg/kg, because the grape is dominant crops in Europe.

**The precautionary principle**

The precautionary principle is an important legal principle for the risk regulation, requires risk regulator enacting standards that aimed to protecting human health and the environment, takeing into account the factors of uncertainty[16]. In risk regulation, the health and environmental damage is more uncertain than the economic loss, and the timing is more distant[19]. Government as the core of risk regulation, in the food safety risk management stage need to consider scientific uncertainty, take strict management measures to protect public health[20].

Due to uncertainties, every countries set the tea pesticide residues regulation need to consider pesticide itself toxic , pesticide residues in food and food consumption and a number of risk factors. In addition to a comprehensive safety risk monitoring and assessment of pesticide active substances, but also with the greatest possible risk-based tea drinkers to consider pesticide exposure.

The risk of cultural perception

Tea pesticide residue risk regulation differences may also originate from different cultural cognition. For instance, after the BSE outbreak, the European Union not only adopted the extreme rigor of special administrative measures to prevent the spread of the epidemic, but also the reconstructed the governance legal framework for food safety, reformed the the legal system, and then draw on the lessons of mad cow disease established a European Food security administration, let the risk management and risk assessment separation. However, the United States has only taken a number of restrictive measures to prevent weaker spread, and don't reform the current food safety framework .

The main reason is that the United States and the European Union public awareness of cultural differences in risk of BSE. On both food culture, the EU's countries preference the traditional and without technology process natural foods, Americans prefer beef, the processing technology food. So when there is the risk of BSE, the European public panic and disgust, prompted the EU to make further reform; but the American people because of the preference for beef makes the risk of mad cow disease panic cognitive somewhat offset, so do not make drastic Regulatory Reform .

The same problem can also be embodied in the tea, the people of Europe love brewing black tea, while Americans prefer instant tea, so the European Union adopted the principle of zero risk, the United States adopted the principle of risk assessment the FAO/WHO; Limited on the number of indicators, the European 454 index, the United States23; the United States there are three indicators are stricter than the EU's in the rigor degree, the same two indicators, as well as 10 indicators lenient than the EU, the pesticide chlorantraniliprole is the largest gap of the EU pesticides standard, 2500 times.

**Conclusion**

After comparing with the EU's, the United States', CAC's tea pesticide residues in risk regulation,

we found that on standard setting, in addition to impact indicator of barriers factors, also affected by the precautionary principle, also affect by the different of risk cultural perception.

In order to avoid the export refund and event criticism, and ensure the maximum national trade interests, should maximize the standard across the gap caused by trade barriers, update tea limits according to international standards, establish a good brand of tea, assure the tea quality security ,and broad development path that China's tea exports to the EU, the US market.

**References**


1. Chen, Zongmao. Problems and Solutions tea sanitation quality facing our country, Tea Bulletin , 2001(01):22-23
2. Gu,Guoda. Niu, Xiaojing. Zhang, Qianjiang. Empirical Analysis of Technical Barriers to Trade on - Taking Tea Trade Example, International Trade Issues. 2007(06):13-16
3. Jiang, Pengfang. Effect of TBT on Chinese Tea Export Trade, Jiangnan University, 2009:56-60
4. Duan, Jiangyu. Hu, Maixiu. US technical barriers to trade on US-China tea empirical analysis, Chinese Agricultural Science Bulletin, 2013(20):33-35
5. Chen, Honglei. Li, Xuan. EU green trade barriers on China's tea exports affect the empirical analysis ,Science and Technology Management Research, 2007(7):9-10
6. Zhao, Peng. New Topic risk regulation rise and Administrative Law, China Law Research Association of Administrative Proceedings 2010, 2010:78-80
7. Wu, Xueyuan. Maximum residue limits and risk assessment of pesticides in tea, Anhui Agricultural University, 2007:66-70
8. Tao, Xueming. Zheng, Yuyan. Hong, Denghua. Huo, Jiajia. China tea trade in the quality and safety problems and cause analysis, Anhui Agricultural Science Bulletin, 2014, 20:11
9. Li, Taiping. Maximum residue limits for pesticides in food standards Vulnerability Analysis, Food Science, 2011（3）:24-26
10. Ma, Huimin. Wang, Yongqiang. Qian, He. Comparative analysis of domestic and international tea pesticide residue limits of, Chinese tea processing, 2012(4)）:44-45
11. Song, Wencheng. Ye, Jiming. Shan, Weili. Learn from the study of international Codex standards for pesticide residues in China's development , The quality and safety of agricultural products, 2010 (03):102-103
12. Gao, Fei. EU pesticide residue monitoring system overview and Enlightenment to China , Beverage Industry 2014 (12):78-81
13. http://news.qq.com/a/20150424/049265.htm
14. Song, Wencheng. Shan, Liwei. Ye, Jiming. Li, Ziang. Zhou, Zhiqiang. Domestic and international pesticide maximum residue limits and trends. Pesticide Science, 2009.11 (4):31-34
15. Zheng, Chuangmu. Qi, Yamei. Bai, Ling. Qian, Yongzhong. Wang, Min. US pesticide residue monitoring system before and experiences. Pesticide Science and Administration, 2010,31 (11):55-57
16. Song, Hualin. Transformation of risk regulation and administrative law principle, National School of Administration, 2007 (4): 61-64
17. Zhou, Li. Chen, Zongmao. New Changes in the EU for pesticide residues and contaminants MRL tea [J]. Chinese tea, 2014 (07):56-58
18. http://www.aqsiq.gov.cn/zjxw/dfzjxw/dfftpxw/201403/t20140303_405190.htm
19. Jin, Zining. Risk Regulation and Administrative Law [M] .2012 (10): 69
20. Yang, Xiaomin. Qi, Jiangang. Cultural Cognition basis of risk regulation reform --- to the EU and US BSE risk regulatory path comparison, 2011 (3): 91-94