Research on the perceived risk of pesticide residues and consumption intention of fresh fruits and vegetables

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Abstract. The situation of pesticide residues in fresh fruits and vegetables was analyzed, and the necessity of the study was proposed; the factors influencing the risk perception of pesticide residues were analyzed, and the risk perception level questionnaire was designed and implemented, and the results showed that the higher the age, income, education level and living standard, the higher the risk perception level of pesticide residues; from the perspective of pulling the food consumption of people with high literacy and high income, strengthening the Internet media's social orientation and supervision responsibilities, and suggesting the government to participate in the supervision and management of the whole food production process, three aspects are proposed to improve the willingness to consume and promote consumption.

1. Introduction
When faced with serious consequences of food safety, consumers basically exaggerate its risks, thereby causing social panic on food safety and deviating consumers' subjective risk perception from the actual food risks. The reason is that risk perception of consumers distorts the objective risks of food safety. In this way, the main factor that determines the safety behavior of consumers is their own risk awareness [1]. Furthermore, consumers are more sensitive to negative information than the positive information on the quality and safety of fruits and vegetables. However, in order to attract consumers' attention, the media is more motivational and enthusiastic about writing negative reports. As a result, consumers’ risk perception is likely to exceed objective risks, which reduces their confidence in the quality and safety of fruits and vegetables in China, and even causes unnecessary panic [2].

Food is the paramount necessity of people, and food safety is the top priority. Food serves as the necessity to maintain human life and health as well as the material foundation for humans to carry out all social activities [3]. Residents are the final consumers of fresh fruits and vegetables. This paper conducts in-depth researches on consumers’ perceptions of organic fresh fruits and vegetables, risk perception on pesticide residues and consuming willingness to understand and explore the influencing factors of consumers’ perceptions of pesticide residues in fresh fruits and vegetables and analyze the characteristics of consumers' risk perception towards fruit and vegetable quality and safety and its influence on consuming willingness. Based on the research results, this paper provides feasible and effective suggestions to enhance consumers' awareness of pesticide residues in fruits and vegetables, which will contribute to better respond and deal with emergencies after incidents of food safety happen, lower consumers' perception of non-objective risks, and recover consumers' confidence in the quality and safety of fresh fruits and vegetables.
2. Influencing factors of risk perception

Pesticide residues refer to the direct or indirect residues of some pesticides in grains, vegetables, fruits, animal products, aquatic products, soil and water after the application of pesticides in the agricultural production \[4\]. It is a common problem of pesticide residues in fresh fruits and vegetables. However, there is no consensus about this phenomenon. Some consumers consider that this phenomenon is common and acceptable. After buying fresh fruits and vegetables, they can wash them. Some consumers think that this phenomenon is normal, and it doesn't matter, while others hold the opposite view. There are many factors that cause different attitudes, including family responsibility, educational level, occupation, personality, cognition, living environment, life experience, etc.

Risk perception refers to people's feelings and understanding of external potential risks, and the possible consequences of external risks can be recognized. Risk perception, proposed by Bauer, refers to consumers' subjective expectation of the severity and possibility of adverse consequences due to the inability to predict the correctness of the purchase decision during the process of consuming food additives \[5\].

The risk perception of pesticide residues in fresh fruits and vegetables is people's risk awareness of pesticide residues in fresh fruits and vegetables and the judgment level of possible harmful consequences. It is specifically manifested in the ability to correctly understand pesticide residues, find the way to determine the related content of pesticide residues, make correct judgement on the risk consequences and harms of pesticide residues to people.

3. Questionnaire design

From the perspective of designing questionnaires, risk perception questionnaires are conducted on the residents of a certain community to study the risk perception of pesticide residues in fresh fruits and vegetables by different consumers. This paper concludes the main factors affecting residents' risk perception as well as the mutual influence between the main factors and risk perception and provides feasible guidance for promoting consumption.

Questionnaires are designed from the following aspects. The specific factors include family responsibility, educational level, occupation, personality, cognitive level, living environment, life experience, age and income. It is generally believed that people with a higher educational level are equipped with a higher cognitive level. Therefore, this paper merges the cognitive level into the educational level. The risk perception level of fresh fruits and vegetables is divided into higher, high, medium and low levels. When designing questionnaires, this paper reflects the level of risk perception by the selection of related questions. There are five questions that can reflect the level of risk perception in questionnaires, namely: Do you usually pay attention to the news or information about fresh fruits and vegetables? Do you care about the problem of pesticide residues in fresh fruits and vegetables? If food pesticide poisoning happens, will you give up the purchase of this kind of product? Will you continue to pay attention to the information on the harmfulness of pesticide residues in the event of such incidents on food pesticide poisoning? Can you quickly determine the information on the pesticide residues of fresh fruits from the product description labels? Those five questions can be answered in two ways: yes and no. When respondents answer yes five times, the level of risk perception is higher. When respondents answer yes four times, the level of risk perception is high. When respondents answer yes three times, the level of risk perception is medium. When respondents answer yes two times or less, the level of risk perception is low.

The educational level is divided into junior high school, high school, college and university and postgraduate. The occupation is divided into science and technology research, agriculture & farming, production line and service industries. The occupation regarding science and technology research includes teachers, doctors, researchers, designers and people in design, development, operation and research. The occupation regarding agriculture & farming includes people involving gardening, pastoral land and fishery. The occupation regarding production and processing includes people in production, processing, manufacturing and workshops. The occupation regarding service industry involves all aspects in the social service industry. The living environment is divided into rented houses
and self-occupied houses, which can characterize the living standards of residents to a certain extent. The life experience is divided into rural origin and urban origin. The age is divided into four intervals, namely, less than 20 years old, 20 years old -- 35 years old, 35 years old -- 50 years old, and 50 years old and above. The income is divided into high-income groups (10,000 yuan and above), middle-income groups (6,000 yuan-10,000 yuan), and low-income groups (6,000 yuan and below). The personality is divided into cautious and courageous type and open-minded type. Lastly, family responsibility is divided into frequent housework and occasional housework.

According to the above specific content, the questionnaires are designed. There are 13 options in questionnaires. The first eight options mainly target at residents' personal information, and the last five options aim at the risk perception level of fresh fruits and vegetables. In the end, the questionnaire survey is conducted among residents of a certain community in Hefei City.

4. Implementation of questionnaires
There are 500 questionnaires distributed to the residents of the community and 446 copies recovered. From the results of the recovery, questionnaires are effective. After conducting statistical analysis on the results of questionnaires, this paper concludes the relationship between risk perception and its influencing factors. The survey results are shown in Table 1.

Table 1. Quantification of the relationship between risk perceived factors and risk perceived levels.

| Personal Information Item          | Number of people | Level of risk perception |
|-----------------------------------|------------------|--------------------------|
|                                   |                  | High | Very high | Middle | Low  |
| **Age**                           |                  |      |           |        |      |
| < 20                              | 49               | 6    | 10        | 14     | 19   |
| 20 -- 35                          | 158              | 89   | 25        | 34     | 10   |
| 35 -- 50                          | 79               | 34   | 20        | 13     | 12   |
| > 50                              | 160              | 103  | 21        | 25     | 11   |
| **degree of education**           |                  |      |           |        |      |
| junior middle school              | 127              | 14   | 22        | 23     | 68   |
| High school                       | 198              | 48   | 52        | 35     | 63   |
| University                        | 96               | 45   | 23        | 17     | 11   |
| postgraduate                      | 25               | 14   | 5         | 3      | 3    |
| **occupation**                    |                  |      |           |        |      |
| Scientific and technological research | 86             | 26   | 30        | 18     | 12   |
| Agriculture, forestry, animal husbandry and by-catch | 94             | 56   | 18        | 11     | 9    |
| Production and processing classes | 123              | 28   | 46        | 21     | 28   |
| Services                          | 143              | 50   | 31        | 38     | 24   |
| rental housing                    | 56               | 14   | 16        | 21     | 5    |
| Housing                           | 390              | 68   | 186       | 101    | 35   |
| **living environment**            |                  |      |           |        |      |
| Rural origin                      | 279              | 45   | 56        | 57     | 121  |
| Urban origin                      | 167              | 23   | 94        | 33     | 17   |
| **income;**                       |                  |      |           |        |      |
| ≦ 6000                           | 179              | 45   | 55        | 73     | 26   |
| 6000 -- 10000                     | 192              | 56   | 68        | 46     | 22   |
| ≥ 10000                           | 75               | 21   | 35        | 10     | 9    |
| **character;**                    |                  |      |           |        |      |
| Cautious and timid               | 288              | 164  | 62        | 45     | 17   |
| Open-minded                      | 158              | 25   | 32        | 55     | 46   |
| **Family responsibilities**       |                  |      |           |        |      |
| Regular household chores         | 312              | 114  | 121       | 45     | 32   |
| Occasionally housework           | 134              | 16   | 19        | 30     | 69   |
It can be observed from the above table that the level of risk perception on pesticide residues boosts with the increase of age. Residents under 20 years old have a lower level of risk perception, while residents over 50 years old possess the highest level of risk perception. Residents in different intervals have varied degrees of attention on their physical health. With respect to the educational level, the higher the education level is, the higher the risk perception will become. Residents in farming, forestry, animal husbandry, side-line production and fishery generally have a relatively high level of risk perception, while residents in the service industry, science and technology research, and production and processing have similar and medium risk perception level. Residents who rent houses possess a moderate level of risk perception. However, due to better living standards and more concern for health, those living in self-occupied houses own a higher level of risk perception. Residents from rural areas are generally equipped with a low level of risk perception. Those people are often in contact with the cultivation of fresh fruits and vegetables, so they do not care about pesticide residues. Residents from cities are more concerned about pesticide residues and have a higher level of risk perception. Regarding the quantitative results between income and risk perception level, it can be found that the level of risk perception improves with the upgrade of income, and the high-income people have the highest level of risk perception. Residents with cautious and timid personality are generally provided with a higher level of risk perception, while it is unobvious for those with open-minded personality. Residents with frequent housework pay more attention to fresh fruits and vegetables, so their level of risk perception is higher, while residents with occasional housework possess a lower level of risk perception.

5. Consuming willingness

Consuming willingness refers to people's willingness to understand and purchase consumer goods. To stimulate consumption and promote economic development, it is necessary to understand people's consuming willingness.

With the analysis of the results in Table 1, it can be observed that residents with older age, higher educational level, higher income and higher living standard are inclined to have a higher level of risk perception on pesticide residues in fresh fruits and vegetables and are more concerned about pesticide residues in food. On the contrary, residents with younger age, lower educational level, lower income and lower living standard tend to have a lower level of risk perception on pesticide residues in fresh fruits and vegetables and pay less attention to pesticide residues in food. Therefore, from the perspective of promoting consumption, it is necessary to focus on groups with high income and high education, strengthen food safety, improve food prices and boost the consumption of such groups.

According to the questionnaire survey, residents' information of food pesticide residues mainly comes from electronic media and Internet, which directly or indirectly affects their attitudes towards food safety and their willingness to consume. In recent years, many incidents about food safety have caused some people to lose their confidence in “food safety”. There is even a popular saying in society that “you can eat if you don’t die after eating.” There are also many elderly residents who develop vegetable plots in cities, live a self-sufficient life, and never go to markets to buy vegetables. In accordance with the news released by the National Health Commission of the People’s Republic of China in early 2014, only 46.3 percent of consumers were confident about China's food safety, while 39.2 percent believed that the overall level of confidence in poultry food safety was low [6]. From these facts, it can be noticed that Chinese people are unoptimistic about food safety at present, and there is an urgent need to improve the situation. Therefore, as a way to disseminate information, the Internet media should stick to the facts rather than exaggerating them and disseminate positive information to the residents to boost their confidence in food safety. Absolutely, the Internet media should also take on the responsibility of supervision, report on the facts and bravely expose food incidents that endanger public safety.

Government departments play a vital role in promoting consumption. Firstly, government departments should shoulder the responsibility of guiding. In other words, they should guide businesses and farmers to pay close attention to food safety, improve food safety and participate in the
entire process of food production. Secondly, Chinese government can establish corresponding rules and regulations, set up special organizations and allocate professional personnel to strictly control the productive process of food and assume the responsibility of supervision and management.

6. Conclusions
(1) This paper puts forward nine factors affecting the level of risk perception on pesticide residues in fresh fruits and vegetables, including family responsibility, educational level, occupation, personality, cognitive level, living environment, life experience, age and income. Furthermore, this paper also analyzes risk perception and design and implement questionnaires. The results of questionnaires indicate that residents with older age, higher educational level, higher income and higher living standard are inclined to have a higher level of risk perception on pesticide residues in fresh fruits and vegetables and are more concerned about pesticide residues in food. On the contrary, residents with younger age, lower educational level, lower income and lower living standard tend to have a lower level of risk perception on pesticide residues in fresh fruits and vegetables and pay less attention to pesticide residues in food.

(2) It is necessary to comprehend people’s consuming willingness under the current market economy system in order to stimulate consumption. This paper puts forward three entry points. In the first place, the government should enhance the willingness of food consumption for the groups with high education and high income and focus on safe, green and organic high-end food. In the second place, the Internet media should spread positive information to people and raise people’s awareness of food safety. Lastly, government departments should keep an eye on the entire process of food production, enhance supervision, strengthen food safety management, set up institutions, formulate rules and regulations and effectively guarantee food safety.

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