Advances in Computer, Signals and Systems (2023)
Clausius Scientific Press, Canada

DOI: 10.23977/acss.2023.070211
ISSN 2371-8838 Vol. 7 Num. 2

Detection of Strawberry Quality Based on Near Infrared Spectroscopy

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Keywords: Near-infrared Spectroscopy; Strawberry; Quality Inspection

Abstract: In recent years, the food quality and safety testing technology in China has been developing continuously. Strawberry is a popular fruit. The detection of strawberry quality includes the detection of its maturity, sugar content, appearance and other parameters. Through the application of effective detection technology, it can provide effective model support for the internal quality, maturity and identification of different varieties of strawberries. In this paper, near-infrared spectroscopy detection technology is studied. First, this technology and its advantages and disadvantages are introduced, and the application of near-infrared spectroscopy based strawberry quality detection technology is explored.

1. Overview of near-infrared spectroscopy technology

1.1. Detection principle

The application of near-infrared spectroscopy in strawberry quality detection. When the fruit is irradiated by near-infrared spectroscopy, the difference in the internal and external characteristics of the fruit is certain, so the absorption and reflection of near-infrared light generated by different parts are different. The information about the composition and structural characteristics of the strawberry is reflected in the near-infrared spectrogram, and the quality information related to the strawberry can be extracted directly from the spectrogram, so as to realize the non-destructive detection of strawberry quality [1]. Relevant research found that the near-infrared spectroscopy technology can be used to quickly detect multiple indicators of strawberry without damaging the appearance of strawberry.

An evaluation method of strawberry sensory quality grade based on near-infrared spectroscopy in the field of non-destructive testing technology for strawberry sensory quality grade, which can quickly and accurately detect the content of a * value, hardness, sugar acid ratio in strawberry powder, and evaluate the strawberry sensory quality grade according to its content. The evaluation result is objective and not affected by the subjective factors of the evaluator. The specific detection process includes: obtaining strawberry samples and grouping; establishing a comprehensive evaluation system of fuzzy mathematics, evaluating the first sample group, and obtaining the sensory quality grade; we can determine the physical and chemical indexes of the first sample group and screen out key quality indicators; Fisher discriminant model of sensory quality grade is constructed; The second sample group is measured by near-infrared spectroscopy to obtain near-infrared spectral information; we can also determine the key quality indicators of the second sample group; A quantitative prediction

model of key quality indicators based on near-infrared spectroscopy is established; The evaluation model of strawberry sensory quality based on near-infrared spectroscopy is constructed to evaluate the strawberry sensory quality grade [2]. The specific detection flow chart is shown in Figure 1 below:

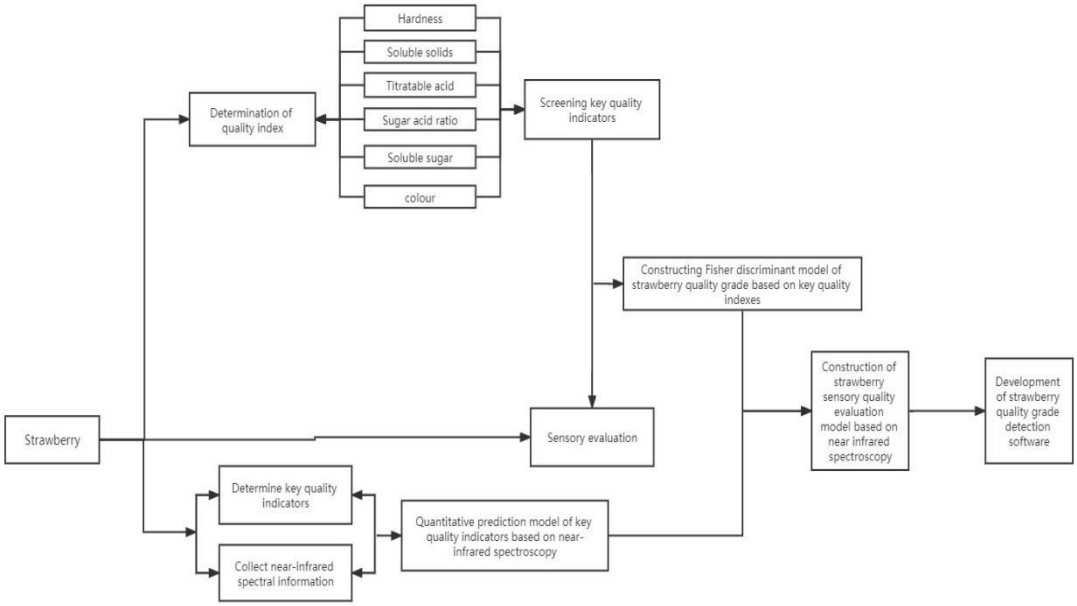

Figure 1: Strawberry quality detection process based on near-infrared spectroscopy

1.2. Technology application

Near infrared spectroscopy is one of the new detection technologies to judge the content of corresponding components through the absorption and reflection of light by substances. It is widely used in fruit quality detection, because this detection technology is safe, fast and efficient, and can detect multiple components.

In the fruit quality detection, the near-infrared spectroscopy technology can be used to detect the internal quality of the fruit, achieve the goal of non-destructive testing, and detect the soluble solids, sugar content, hardness and acidity of the fruit without damaging the shape and quality of the fruit [3]. In fruit sorting, near-infrared spectroscopy technology is also widely used. This detection technology can ensure efficient detection, and can also detect multiple indicators of fruit at the same time. This detection technology has been applied to the fruit sorting process to ensure reliable fruit quality, avoid the quality problem of manual selection, and promote the work efficiency of detection and sorting significantly.

To sum up, near-infrared spectroscopy has many advantages in the application of non-destructive testing of fruits. Its technical application is relatively fast, and the overall detection efficiency is high. It can detect the soluble solids, sugar, acidity, etc. in fruits. For the internal quality of fruits, it can achieve accurate detection. By comparison, the application of this detection technology in fruit grading and classification is not obvious. Compared with foreign countries, the research on near-infrared spectroscopy technology in China started late, and the maturity of related technologies is not enough. The application of near-infrared spectroscopy technology in fruit quality detection can effectively learn from the experience of developed countries and advanced technical instruments, improve the construction of detection standards, and constantly promote the better application of this detection technology in fruit quality detection [4].

Detection of the internal quality of fruit, but the application effect in fruit grading and classification is not outstanding. The research on near-infrared spectroscopy technology in foreign countries started

earlier than that in China, and the related technology is more mature. Therefore, using near-infrared spectroscopy technology to detect fruit quality can learn from the relevant experience of developed countries, introduce relevant near-infrared spectroscopy technology, formulate technical standards, and promote the continuous improvement of technical weaknesses.

2. Application of near-infrared spectroscopy in strawberry quality detection

2.1. Application in strawberry sugar content detection

In strawberry quality detection, sugar content determines its sweetness and taste, so it is one of the key indicators of strawberry quality detection. At this stage, the sugar content of fruit is mostly measured by the sugar meter, but this method takes a lot of time, and needs to insert the sugar meter into the fruit, which will damage the fruit structure, and the sugar content distribution is not necessarily uniform. This method cannot comprehensively detect the total sugar of fruit. This can be achieved by using near-infrared spectroscopy. The near-infrared spectrum was used to irradiate strawberries. The study found that the prediction accuracy of the sugar content analysis model was relatively high and the error was small when the PLS method was used within the wavelength range of 200-1100 nm.

2.2. Application in strawberry acidity detection

Strawberry species contain many organic acids, inorganic acids and acid salts, such as citric acid, tartaric acid, etc. Acidity also has a direct impact on the quality of strawberry, which is one of the important indicators in strawberry quality detection. Acidity affects strawberry flavor, and the content of acid compounds in strawberry will change with the improvement of fruit maturity. During fruit processing, controlling its acidity and alkalinity is an important method to prevent enzymatic browning [5]. Based on the application of near-infrared spectrum detection technology, the quantitative analysis model of acidity in strawberries can be constructed by PLS method, which can effectively detect the acidity content in strawberries. The correlation coefficient of the model in the detection results is 97%, and the results of the model and the actual acidity content in strawberries are basically consistent, which verifies that the detection accuracy of the model is relatively ideal, and the gradual deviation between the detection results and the actual situation is small.

2.3. Application in strawberry hardness test

Hardness is an important indicator to measure the quality and storage of vulnerable fruits such as strawberry, and it is also one of the important indicators to determine the maturity and picking time of fruits. For strawberries, hardness testing is an important reference to determine whether storage, packaging, transportation and other work have been completed. Based on the near-infrared spectroscopy technology to detect strawberry hardness, we can get better results. When it is applied to strawberry hardness testing, a strawberry hardness testing model can be constructed based on the improvement of partial least square method. This type of model has high detection accuracy and strong technical feasibility.

2.4. Application in the detection of soluble solids content in strawberry

The soluble solids in strawberry include sugar, acid, vitamin, etc. These substances are important indicators to judge the maturity, internal quality and processing characteristics of strawberry. Through the application of near-infrared spectroscopy in strawberry detection, the NIDRS technology was

used to build a detection model for soluble solids content in strawberry, which could obtain a better prediction effect.

3. Conclusion

From the research, the application of near-infrared spectrum detection technology in strawberry quality detection has certain technical advantages, which can make up for the shortcomings of traditional fruit detection technology and improve the detection efficiency and accuracy. From the analysis, the application of near-infrared spectrum detection technology in strawberry quality detection can achieve relatively accurate detection of sugar content, acidity, maturity (hardness), soluble solids, etc. in strawberries. Because this kind of fruit detection technology can ensure the nondestructive detection effect, it can be popularized and applied in fruit quality detection.

Acknowledgement

Fund Project: 2020 School Enterprise Cooperation Project of Jiangsu Vocational and Technical College of Agriculture and Forestry "Research on Strawberry Quality Nondestructive Testing Technology Based on Near-infrared and Impedance Spectrum Information Fusion" (Project Number: 2020kj034).

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