

Phytochemical screening and identification of spoiled fruits and vegetables

Análisis fitoquímico e identificación de frutas y verduras en mal estado

Shrike A.V.¹, Sankpal S.T.², Surve R.R.^{1*}

1- Assistant professor, Department of chemistry, A.C.S. College, Lanja, India

2- Department of chemistry, A.S.P. College, Devrukh, India

*E-mail: surverishikesh1@gmail.com

ABSTRACT

Fruits and vegetables, being the richest sources of various nutrients, are an essential component of a diet that is focused on health, and both variety and quantity are equally essential. A diet that is rich in vegetables and fruits of high quality can help people avoid many different ailments. As a result, it is essential to conduct a quality inspection on fruits and vegetables. The consumption of spoiled or rotten foods can lead to illness and unhealthy. In this paper, the quality of a few fruits and vegetables containing alkaloids are tested with the three reagents viz. Barfoed, Dragendorff and Mayer's reagent which are used to test alkaloids. It is concluded that all these reagents can be utilized successfully to identify the good or spoiled quality of fruit and vegetables.

Keywords: Barfoed reagent, Dragendorff reagent, Mayer's reagent, fruits and vegetables.

RESUMEN

Las frutas y verduras, al ser las fuentes más ricas en diversos nutrientes, son un componente esencial de una dieta que se enfoca en la salud y tanto la variedad como la cantidad son igualmente importantes. Una dieta rica en verduras y frutas de alta calidad puede ayudar a las personas a evitar un gran número de distintas dolencias. Por ello, es esencial realizar un control de calidad de las frutas y verduras, ya que el consumo de alimentos en mal estado o podridos puede provocar enfermedades e insalubridad. En este artículo se analiza la calidad de algunas frutas y verduras que contienen alcaloides con tres reactivos: de Barfoed, de Dragendorff y de Mayer, los que se utilizan para analizar los alcaloides. Se concluye que todos estos reactivos pueden utilizarse con éxito para identificar la calidad buena o deteriorada de frutas y verduras.

Palabras clave: reactivo de Barfoed, reactivo de Dragendorff, reactivo de Mayer, frutas y verduras.

INTRODUCTION

Fruits and vegetables ought to constitute a significant portion of one's daily diet. They are naturally beneficial and include essential vitamins and minerals, both of which contribute to one's ability to maintain a healthy lifestyle. Due to the fact that many of them contain antioxidants, they can also assist to protect against certain diseases. There are a wide variety of fruits and vegetables available, each of which can be prepared, cooked, and served in a variety of different ways. When it comes to purchasing fruit and vegetables, the greatest time to do it is when they are in season. If fresh produce is not an option, consider purchasing vegetables that have been frozen or

canned; not only are they cheaper, but they also maintain their nutritional value. A diet that is rich in fruit and vegetables can assist in the inhibition of obesity and the preservation of a healthy weightiness, as well as in the reduction of cholesterol and blood pressure. According to the findings of numerous studies, it is preferable for one's health to acquire these nutrients from their natural food sources, such as fruits and vegetables, rather than from dietary supplements.

Air, moisture, light, temperature, and the growth of microorganisms are some of the most important factors that contribute to the problem. The vast majority of fruits and vegetables quickly become spoiled as a result of the harm done by microbes. In order to grow, maintain their energy levels, and reproduce, microorganisms including bacteria, yeast, and moulds require water and nutrients. Because they contain an average water content of more than 90 percent, fruits and vegetables grow on the outdoor of foodstuff or inside the gaps or fractures and quickly become spoiled. The outer layers of fruits and vegetables begin to deteriorate when they are exposed to light. This process, known as photo degradation, is responsible for the browning, loss of flavor, and breakdown of vitamins and proteins. People who consume contaminated produce run the risk of becoming ill and may possibly need to be hospitalized. Foodborne infections are caused when fruits and vegetables that have been contaminated with bacteria. The ever-increasing demand for freshly harvested fruits and vegetables has compelled producers to ramp up their output. Vegetables are more likely to be contaminated with pathogenic bacteria due to the increased production required to fulfil rising demand. This raises concerns about the food safety of customers.

There are wide varieties of methods to decide quality of fruits and vegetables. They include both destructive and nondestructive techniques. Destructive technique includes various physical and chemical methods to determine quality. Texture, taste, firmness, flavor, smell, and nutritional value can be assessed by destructive methods whereas nondestructive technique includes use of some advanced instruments electronic nose, impact test, near infrared spectroscopy, time-resolved reflectance spectrometry, nuclear magnetic resonance, ultra, sonic, X-Ray acoustic impulse reply method, electrical conductivity methods etc. which are costly to check to assess quality of food sample.

MATERIALS AND METHODS

All the required fruits and vegetables were bought from local market and all the tests were carried out in the chemistry laboratory. All the chemicals which were utilized for the experiments were AR graded. All the three reagents viz. Barfoed reagent, Dragendorff reagent, Mayer's reagent were prepared and each fruit and vegetable was tested to check its quality. The methodology utilized for every reagent tests are as follow.

Barfoed test: 1 ml Barfoed reagent (0.3 molar cupric acetate solution in 1% acetic acid solution) + 2 ml of extract boiled for three minutes. Red precipitate formation indicates the presence of alkaloid where spoiled fruits and vegetable sample do not give red precipitate. If deviation in any observation is obtained, especially grey color in this case, which indicates the change in the structure of alkaloid.

Mayer's test: 1 ml Mayer's reagent (mercuric chloride and potassium iodide dissolves in water) + 2 ml of plant extract, cream coloration indicates presence of alkaloid in the given sample but when Mayer's reagent is

treated against the spoiled sample, it gives cream coloration at junction with colorless liquid which indicates change in the structure of alkaloids that is given fruit sample is not good and beneficial for human body.

Dragendorff test: 1 ml Dragendorff reagent (Bismuth nitrate and potassium iodide dissolve in acetic acid) + 2 ml of sample. Grey coloration is obtained for fresh fruit sample which indicates presence of alkaloid. But when same procedure was followed for contaminated fruit, it gives red color junction at top of the liquid which indicates that the structural change and defect in the structure of alkaloids.

RESULTS AND DISCUSSION

According to study, contamination in fruits is only seen when it is present outside of the fruit. In this paper, quality of fruits and vegetables were checked by chemical methods. There are three tests included to check the quality of samples or to check presence of alkaloid in that sample.

Barfoed test gives red precipitation for good and healthy quality of food indicating presence of alkaloid in that sample. But for defective sample, this observation deviates and gets grey coloration which shows that change in the quality of sample.

All the alkaloids contain one nitrogen with the lone pair of electrons. This lone pair take participation in the reaction and form coordinate covalent bond with metal of the reagent and therefore shows red coloration showing presence of alkaloid. But for poor quality of fruit, it gives grey coloration which indicates that there is no lone pair available to form bond with metal that is the structure of alkaloid is ruptured therefore it is not as beneficial for human health.

Mayer test and Dragendorff reagent also give same kind of observation where for good quality sample, Meyer test give cream coloration because lone pair of alkaloid form coordinate covalent bond with potassium metal. But poor-quality sample change that observation and give junction with colorless junction indicating that structural change of alkaloid. Similarly, Dragendorff give grey coloration form bond with potassium metal in presence of Bismuth nitrate but for bad quality fruit the observation changes to give red color junction.

All the test indicates that poor quality fruit and vegetables if chemical composition changes, then it will not provide proper nutrients to body which is less beneficial for human health.

Sample of fruits and vegetable	Barfoed Reagent		Mayer's Reagent		Dragendroff Reagent	
	Good	Bad	Good	Bad	Good	Bad
<i>Solanum tuberosum</i>	Red precipitate	Gray color	Cream color	Cream precipitate at junction with color.	Gray color	Red color junction
<i>Solanum lycopersium</i>	Red precipitate	Gray color	Cream color	Cream precipitate at junction with color.	Gray color	Red color junction
<i>Punica granatum</i>	Red precipitate	Gray junction at top	Yellow color	Yellow precipitate at junction	Gray color	Red color junction
Citrus	Red precipitate	Gray junction at top	Yellow color	Yellow viscous precipitate	Black color	Maroon junction
<i>Malas domestica</i>	Red precipitate	Gray junction at top	Yellow color	Yellow viscous precipitate	Black color	Maroon junction
Citrus limetta	Red precipitate	Gray junction at top	Yellow color	Yellow precipitate at junction with colorless liquid	Black color	Maroon junction
<i>Manilkara zapota</i>	Red precipitate	Gray color	Yellow color	Yellow viscous precipitate	Black color	Maroon junction
<i>Coriandrum sativum</i>	Red precipitate	Gray precipitate	Cream color	Cream color precipitate at junction	Gray color	Red color junction
<i>Spinacia oleracea</i>	Red precipitate	Gray Junction	Cream color	Cream color precipitate at junction	Gray color	Red color junction

CONCLUSION

All these reagents determine the quality of fruits and vegetables containing alkaloids successfully. These reagents easily distinguish the good or spoiled quality of fruits and vegetables with low cost as compared to many other methods. This method can be used by farmers, dealers, distributors, caning or juicing industries to check or regularly assess the quality of fruits and vegetables.

REFERENCES

- Alkaloids test. (n.d.). Wikipedia. <http://Wikipedia./alkaloids test.pdf>
- Alkaloids. (n.d.). <http://chemweb.ucc.ie/courses/PF100 1/CM3101%20Alkaloids%20I.pdf>
- Anila L, Vijayalakshmi NR, Tian C. Beneficial effect of flavonoids from *Sesamum indicum*, *Emblica officinalis* and *Momordica charantia*. *Phytother Res* 2000; 14:592-595.
- Finar IL. *Organic chemistry: Stereochemistry and the chemistry of natural products*. 5th ed. Singapore, Singapore: Longman Group 1989; 517-605.

Sustainability, Agri, Food and Environmental Research, (ISSN: 0719-3726), vol 12(2), 2024
<http://dx.doi.org/10.7770/safer-V13N1-art232>

Green CR and Christie GS. Malformation of rats induced by the pyrrolizidine alkaloid, heliotrine. Br. J Exp Pathol. 1961;2: 369–378.

International Journal of Current Pharmaceutical Research, preliminary phytochemical screening of cocos nucifera L. Flowers. Dyana j p and kanchana G.

International journal of pharmaceutical chemical and biological sciences, alkaloids in foods, Ranjita D and K sudha.2015,896-906

Narayana KR, Reddy MR, Chaluvadi-Krishna DR. Bioflavonoids classification, pharmacology, biochemical effects and therapeutic potential. Indian J pharmacol 2001; 33(1): 2-16.

Research journal of pharmaceutical, biological and chemical sciences, physicochemical investigation of plant sesbania sesban, Kumar Sandeep, Bajwa bajinder signh and Kumar narinder.0975-8585

Stray F. The Natural Guide to Medicinal Herbs and Plants. Tiger Books International. London, 1998: pp. 12-16.

Received: 11th December 2022; Accepted: 22th December 2022; First distribution: 24th April 2023

