

## Identifying the origin plant of starches by numerical description of the coloration of iodine-starch reaction solutions

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### Abstract

Microscopy is the primary technique for identifying the origin plant of a starch sample but requires operators with highly proficient skills and experience, and is unsuitable for discriminating modified starches such as pregelatinized starches. The plant species from which the starch is isolated is reflected in the characteristic color of the iodine-starch reaction solution. However, visual observation is subjective and vague because color perception is organoleptic and color is expressed by ambiguous names such as “orange-red” and “deep blue”. Quality management using the color of samples is gaining wider acceptance in the field of natural products as well as industrial products because simple, easy to use, high-performance spectrophotometers are now widely used. In this study, the color of iodine-starch reaction solution of 31 kinds of starches and pregelatinized starches from maize, wheat, potato and rice were measured spectrophotometrically and the color was numerically described using the  $L^*a^*b^*$  color system. The characteristic ( $a^*$ ,  $b^*$ ) values grouped together on the color system according to the origin plant for each starch, suggesting that numerical information on the color reaction is useful for estimating the origins of starches.

Keywords : starch, origin plant, spectrophotometer,  $L^*a^*b^*$  color system

## I Introduction

Starch isolated from various plants, such as maize, potato, wheat, rice, pea and kudzu, is used as food and as food additives. Starch differs not only according to the species of plant from which it is isolated, but also according to the plant variety, such as glutinous or non-glutinous rice. Each type of starch is used for a different purpose in accordance with its texture and function, and the price of a specific starch depends on the amount of starch in the specific plant and the rarity of that plant. Furthermore, different tariff rates are imposed on imported starches<sup>\*1</sup>. Potato starch is currently used in lieu of rare dogtooth violet starch because of its ready availability and low price, and the raw material is clearly specified as potato starch by the manufacturer. However, the wide variation in price for similar food ingredients has led to instances of unethical use of cheaper substitute ingredients. Consequently, there is need for testing methods that can identify the origins of food ingredients.

Microscopy is the primary technique used for identifying the plant species origin of a starch sample but requires operators with highly proficient skills and experience, and is unsuitable for discriminating modified starches such as pregelatinized starches. We previously studied identification methods for discriminating starches with different degrees of pregelatinization (none, partly and totally) and found that the iodine-starch coloration was most likely characteristic of the plant species from which the starch was isolated<sup>1)</sup>. However, visual observation is subjective and not definitive because color perception is organoleptic, and coloration is expressed by ambiguous names such as “orange-red” and “deep blue”, even in books written for specialists and in compendia. Further, translations of terms used to describe color between languages may also cause confusion.

Quality management using the color of samples is gaining wider acceptance in the fields of natural products as well as industrial products because simple, easy to use, high-performance spectrophotometers are now widely used<sup>2-7)</sup>.

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\*1 <http://www.customs.go.jp/tariff/kaisetu/index.htm> (Nov. 28, 2018)