

A study on synthetic food colors used in foods

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Introduction

Acceptable daily intake(ADI) of synthetic food colors were evaluated by Joint FAO/WHO Expert Committee on Food Additives(JECFA). A study on survey and total diet intakes of food additives in foods have carried out continuously, even though development of analytical methods for contents of these food additives from various food are required. Eight synthetic food colors are permitted and established standards for use in Korea.

In this study, using a simple and widely applicable method for simultaneous determination of eight synthetic food colors in various food by ion-pair high performance liquid chromatography, we investigated contents of eight synthetic food colors in seven kinds of foods and compared to that of questionnaire survey.

Materials and Methods

Samples

They are 8 categories, as Soft drink, Candy, Chewing gum, Ice cream, Snack, Chocolate, Alcoholic beverage and Bread. Total number of samples were 369.

Synthetic food colors

Food Blue No.1(Brilliant Blue FCF, B1), Food Blue No.2(Indigocarmine, B2), Food Green No.3(Fast green FCF, G3), Food Red No.2(Amaranth, R2), Food Red No.3(Erythrosine, R3), Food Red No.40(Allura Red, R40), Food Yellow No.4(Tartrazine, Y4), Food Yellow No.5(Sunset Yellow FCF, Y5)

Preparation and clean-up

After samples were diluted, filtered, extracted or centrifuged by various solvent and adjusted to pH 5~6 by 1% ammonia water or 1% acetic acid, then colors were isolated, clean-up and concentrated using Sep-pak C₁₈ cartridge. The colors eluted from cartridge were finally determined by high performance liquid chromatography.

HPLC conditions

Primary eluant(A) : 0.025M ammonium acetate(containing 0.01M tetrabutylammonium bromide)-acetonitrile-methanol(70:20:10), Secondary eluant(B) : 0.025M ammonium acetate(containing 0.01M tetrabutylammonium bromide)- acetonitrile-methanol(40:50:10), Column : symmetry C₁₈(5 μ m, 3.9mm i.d. \times 150mm), Flow rate : 1.0ml/min, Detection : wavelength of 254nm

Results and Discussion

Recovery and detection limit

Recoveries of 8 synthetic food colors from foods spiked at 10 μ g/g were found to be 79.0~95.4% for B2, 92.3~102.1% for B1, 90.9~101.3% for G3, 84.9~100.9% for Y4, 94.7~98.3% for Y5, 87.4~100.4% for R2, 85.1~97.7% for R3 and 92.3~99.1% for R40, respectively.

The detection limits range of each colors were 0.01~0.05 μ g /g.

Contents of synthetic food colors in foods

The mean contents range of colors in eight kinds of foods were 0.45~6.81mg for B2, 3.79~41.87mg for B1, 0.72~13.59mg for G3, 1.87~36.75mg for Y4, 2.41~25.73mg for Y5, 2.77~19.35mg for R2, 0.64~20.87mg for R3 and 8.23~110.75mg for R40, respectively. The highest and lowest contents of colors came from G3 and R40.

Comparision of Analytical results and Questionnaire survey results

Fig. 1 summerizes the comparison of distribution ratio of the analysis and questionnaire per food colors in foods. Fig. 2 summerizes the comparison of distribution ratio of the analysis and questionnaire in Food Yellow No.4(Tartrazine) and Food Yellow No.5(Sunset Yellow FCF) per each food item, respectively. There were not large differences in distribution ratio of the analysis and questionnaire data per food colors in foods. But In the analysis and questionnaire in Food Yellow No.4(Tartrazine) and Food Yellow No.5(Sunset Yellow FCF) per each food item, differences of distribution ratio were observed.

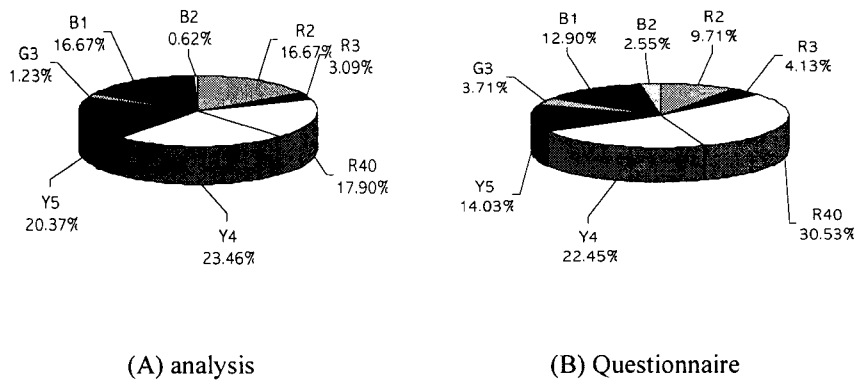


Fig. 1. Comparison of distribution ratio of the analysis and questionnaire per food colors in foods.

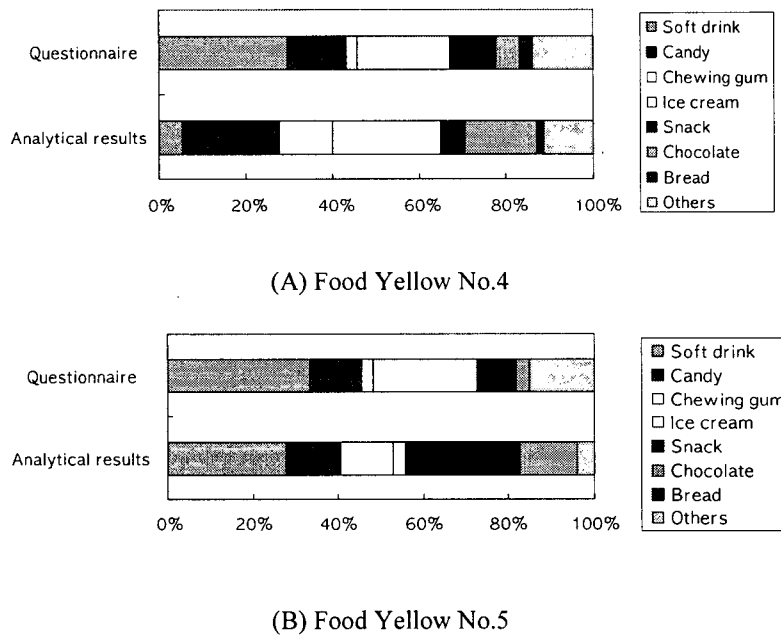


Fig. 2. Comparison of distribution ratio of the analysis and questionnaire in Food Yellow No.4(Tartrazine) and Food Yellow No.5(Sunset Yellow FCF) per each food item.

Conclusions

This study has been carried out to measure the contents of 8 permitted synthetic food colors(including Brilliant Blue FCF, Indigocarmine, Fast green FCF, Amaranth, Erythrosine, Allura Red, Tartrazine, Sunset Yellow FCF) in commercially available foods in Korea. The contents

of synthetic food colors were determined by HPLC for foods such as breads, snack, candy, alcoholic beverages, soft drinks, ice cream, chocolate and chewing gum. Recoveries of 8 synthetic food colors from foods spiked at 10µg/g were found to be 79.0~102.1(%) for each food. The mean contents range of colors in eight kinds of foods were showed as follows : 0.45~6.81mg for B2, 3.79~41.87mg for B1, 0.72~13.59mg for G3, 1.87~36.75mg for Y4, 2.41~25.73mg for Y5, 2.77~19.35mg for R2, 0.64~20.87mg for R3 and 8.23~110.75mg for R40, respectively. These results could be use as basic data for the study on dietary intake survey and risk accessment of sythetic food colors in food.

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