

Letter to the Editor

Banana as a relevant source of anthocyani(di)ns in European populations?

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Recently, Zamora-Ros *et al.*⁽¹⁾ published interesting results using the large European Prospective Investigation into Cancer and Nutrition (EPIC) dietary data set in combination with anthocyanidin content data from two databases (USDA database for the flavonoid content of selected foods⁽²⁾ and Phenol-Explorer⁽³⁾) for an estimation of anthocyanidin intake in ten European countries. They revealed differences in anthocyanidin intake between northern, central and southern Europe. We agree with the authors that ‘these descriptive data will be valuable for future aetiological research focused on the relationships between anthocyanidins and chronic diseases’. We also agree to the authors indicating that it is important to take into account differences among individual anthocyanidins regarding their effects against cancer and cardiovascular as well as neurodegenerative diseases.

However, we do not agree with the statement ‘there are no large differences in the anthocyanidin data between the two databases’, at least on one point: one noticeable difference is the relatively high delphinidin value (7.39 mg/100 g) given for bananas by the USDA database⁽²⁾ in contrast to no anthocyanidin values given for bananas by Phenol-Explorer⁽³⁾. As bananas are stated as the major source of delphinidin in EPIC subjects from central and northern Europe and the second main source in those from southern Europe in the results section of Zamora-Ros *et al.*⁽¹⁾, we assume that the authors used the value from the USDA database. However, in the supplementary table provided by Zamora-Ros *et al.*⁽⁴⁾ bananas are not listed, despite the fact that their delphinidin content listed in the USDA database is higher than that of other fruits provided in the supplementary table and the fact that banana is mentioned as a relevant source.

In this context, we would like to comment on two points. First, as estimated anthocyanidin intake is supposed to be a measure for anthocyanin intake assuming that they or their metabolites are effective in promoting health-benefits, it is essential to include only those anthocyanidin values in intake estimations supposed to be derived from anthocyanins. It has not been shown yet that bananas contain anthocyanins^(5–7), but rather contain proanthocyanidins⁽⁸⁾ or not yet specified anthocyanidin-polysaccharides⁽⁶⁾. The analytical methodology used to generate the values for bananas in the USDA database^(2,9), which was used for the intake estimation of Zamora-Ros *et al.* and other studies,

is probably not suitable to measure anthocyanidins from anthocyanins⁽⁷⁾. Therefore, we suggest to exclude this delphinidin value for bananas from the intake estimations of anthocyanins^(7,10). As a consequence of questioning a specific content value, the derived results and interpretations have to be questioned, too. In the present analysis of EPIC data, the inverse regional gradient found for delphinidin, in contrast to the increasing intake of total anthocyanidins, cyanidin, malvidin and peonidin from north to south, might be affected by the exclusion of the delphinidin value for bananas. One could assume that anthocyanidins derived from molecules other than anthocyanins, e.g. from proanthocyanidins, are also bioaccessible in humans and lead to the same effects as those derived from anthocyanins. But in this case, any anthocyanidin derived from molecules other than anthocyanins in any food should be included in the intake estimations, not only those found in bananas.

Secondly, irrespective of the doubts concerning the delphinidin value for bananas, the estimated contribution of bananas to anthocyanidin intake cannot be retrieved from the data as presented. In Table 4, presenting the contribution of foods to the intake of anthocyanidins it is not apparent to which group bananas were allocated. The only reasonable group among those mentioned in this table would be berries, as botanically bananas are berries. But then, it would not be likely that bananas are mentioned as the main source of delphinidin in northern and central Europe and at the same time the berries group is stated as the third important source after non-alcoholic beverages in the results section. The real contribution of bananas to delphinidin intake in this estimation is therefore not clear.

In conclusion, we are aware of the great possibilities for identifying the effects of anthocyanins on diseases with the EPIC data, but we believe that it is important to first be certain about the underlying content data before using them for aetiological studies on the relationship between anthocyani(di)n intake and chronic diseases.

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