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Research article

Estimation of potassium content of different varieties of banana fruit in an Indian delta Is there a clinical relevance

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ABSTRACT

Banana fruit is one of the commonly taken foods in many parts of the world. The fruit is known for its high potassium content. We wished to study the potassium content of eleven types of ripe banana fruit available in the cauvery delta region of South India. We measured two values in each of the eleven types of banana fruit. We found the mean varied from 460.75mg/100gm in the Rasthali variety to 921.75 in the karpura valli variety. The potassium binding capacity of the soil and the fertilizers pumped may influence the values. The literature which presently describes the values between 200 to 400mg/100g cautions the use of bananas in patients taking antihypertensive medications like enalapril and in patients with renal dysfunction. Our study which shows the values to be double the described ones, will throw light on additional caution in such cases. We admit that there was no soil study in this work which can influence the potassium content. Before any dietetic advice on the intake of potassium, the bananas of the concerned geographical area and such high potassium values should be taken into account. When the needs to cater the patients of potassium arise in uncomplicated hypertension, the varieties karpuravalli and peyampalam can be considered.

Keywords: fruit, banana, potassium

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INTRODUCTION

Universally banana is one of the most important crops and the fruit is a routinely consumed item all over the world. Even though there are a lot of nutrients and minerals in banana, potassium is the most talked about nutrient. It is one of the potassium rich foods that we take regularly [1]. But there are inhibitions about the use of the fruit in patients taking Angiotensin Converting Enzyme (ACE) inhibitors and in patients with deranged renal function, possibly due to the risk of hyperkalaemia [2]. A high potassium intake may be better in some patients with hypertension. There are different types of bananas with differing mineral content. There are no studies to differentiate the content of potassium and analyse the same with any possible clinical relevance. As the search of the internet revealed the potassium content of banana [3], to be around 300mg/100gm, we wished to find out the amount in different species of banana to probably suggest a possible correlation of intake of any specific type in a few clinical conditions.

Aims

To find out the amount of potassium in different varieties of banana available in the Cauvery River delta of South India.

To possibly identify the variety which may be clinically relevant in patients with specific illness like hypertension and chronic renal failure?

MATERIALS AND METHODS

After a thorough initial evaluation of various species of banana with botanists, agriculturists and vendors, we found out that there are 11 varieties commonly found in this place. We purposely avoided different areas to decrease any soil differences and their impact. Hence the bananas grown in the same delta region were selected. They are named as described. The names were confirmed after expert opinions (Figures 1 and 2).

Figure 1. showing a few types of bananas



Figure 2. showing a few more types of bananas



The potassium content was measured as follows. The potassium filtrate was prepared as per William Twine technique and used for potassium estimation by flame photometer (Systronics-128-India) with standards being prepared with potassium chloride^[4]. We adapted this particular technique of estimation as this is time tested and affordable. All samples were only ripe bananas which were also confirmed with botanists and vendors. No unripe specimen was used. All modes of artificial ripening methods were not used. As the results showed a big difference in potassium content, another similar set of bananas were again used to estimate the amount of potassium in the fruits. The next set of results was within 5 % change in the content. Hence, we decided to take the mean values as the final one. This study is simply designed to estimate the amount of potassium in different varieties of banana grown in the same area and as such this study has neither positive nor negative controls.

RESULT

Table 1. Mean Potassium content of banana varieties

Banana varieties	Potassium (mg/100g)
Poovan	522.62
Monthan	548.56
Rasthali	460.45
Pachynada	506.78
Ney valai	590.01
Karpuravalli	921.75
Chevvilai	803.56
Malaipalam	708.02
Peyampalam	876.24
Robusta	660.01
Elaki	629.27

We find the potassium content being highest in karpuravalli while it's the lowest in Rasthali variety. Banana fruit is one among the identified food rich in potassium. It has been recommended for patients with hypertension. A Nigerian study showed a variation of potassium content to be 60 mg to 200 mg/ 100 gram^[1]. The amount of potassium varied with a minimum of 460 mg in the rasthali variety to 920 on the karpuravalli variety. But many studies and search from the internet revealed potassium content of 300 – 450 mg/100 gram of banana fruit^[5]. But in our results, the minimum value is for the type Rasthali which has 460 mg/100g. The highest value was in karpuravalli type which showed a value of 920 mg/100g. This was very high when compared to any earlier reports. This alarms the

scientific community because the values of many varieties are almost double the value described.

As potassium is highly susceptible to leaching losses in a few light textured soils, split application of potassium is very essential. In a study by Sathiamoorthy, the potassium binding capacity is very high in the delta when compared to other districts^[6]. This may contribute to high potassium content in our study. The major limitation in our study is our lack of any estimation of soil potassium levels. Miller had found that eating two servings of banana fruit increases the plasma potassium to a significant level in half an hour^[7]. They have also found that a muscle transfer of mineral does not happen so swiftly to decrease the muscle cramps in athletes. Hence with such a high content and a possible rise within half an hour can contribute to a possible interaction with the antihypertensive drug ACE inhibitor to attain dangerous levels. With the summation of these two findings, we can deduce that the delta basin of the river cauvery of south India produces bananas which need to be classified to assign which one is safe in renal diseases.

Potassium-induced reductions in blood pressure significantly lower the incidence of a stroke, ischemic heart disease, but there are other advantages also. Studies have described that 85% of the ingested potassium is absorbed^[8]. All these advantages have been described only in places where the mean potassium content is around 300mg. Can it be extrapolated to the people living in South India remains a big question? With increased incidence of renal diseases, the type of banana is to be clearly mentioned in the dietary chart because, karpuravalli may be the one which can be avoided according to our estimates. As such no such studies are available with analyses of potassium content among banana fruits to assign them for differing indications. With an increase in the consumption of processed and fast foods and the concomitant reductions in the intake of fruits and vegetables, potassium intakes are less than 50 nmol/L in large number of populations. These reductions are many times also mirrored with high sodium intakes. Accelerated ripening with smoke can increase potassium and decrease the fibre content of banana^[9]. This was avoided in our samples. An enquiry of the agriculturists revealed that all bananas taken for studies were produced after routine application of artificial fertilizers. Whether this application has influenced the potassium content is also to be studied.

Even though there are a lot of foods with higher potassium content than bananas like apricot seeds, they are not consumed commonly. Hence study of potassium content in bananas assumes significance. The limitation of the study was that all samples were collected from the same delta fields and the size is small. This is not a multicentre study to evaluate the bananas in terms of their content in different parts of the globe. Our next limitation was that we have not

estimated the bioavailability of this ion in the normal human gut and their potential to rise the serum potassium levels. Yet we have attempted for the first time, to classify bananas in terms of potassium content for favour of further research in this field.

CONCLUSION

The potassium content of eleven different varieties of bananas was found to be very much higher than described in the literature. The variety “Rasthali” (460mg/100gram) and the karpuravalli (920mg/100 grams) were the two extremes with the other values between the two. The literature already cautions the use of bananas in patients on ACE inhibitor drugs and renal failure. With such high values described in our study, this assumes further significance. The preference of the variety in different disease have to studied further.

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