Comparative Evaluation of Antioxidant Properties in Varieties of Banana in Southern Kerala

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ABSTRACT: *Medicinal and dietary uses of banana are astonishing. The present study highlights the fact that selected banana varieties serves as a natural store of various health beneficial antioxidant compounds. Current study is an attempt to find out and estimate antioxidant levels in different banana varieties. The banana varieties selected for the current work are Nendran, Kappa and Rasakadali. Phytochemical screening was conducted and the presence of Tannins, Saponins, Flavonoids, Alkaloids, and Phenols were detected in each variety. Phytochemical assay revealed the presence of some phytochemicals like phenols, tannins, alkaloids, saponins and flavonoids at varying concentrations. The presence of these phytochemicals confirms, the three Musa species tested to be of medicinal value. Out of five parameters tested in three sps. of Musa namely Nendran, Kappa and Rasakadali, it was found that Tannin(771.41**)** content was far greater when compared to Flavanoid (133.5)and Phenol (0.248) in the three varities of musa. Of all the five parameters listed above, Rasakadali exhibited least values. The phenol content in all the banana varieties was considerably low when compared to others.*

Key Words: *Antioxidant, Phytochemical, Nendran, Kappa, Rasakadali.*

INTRODUCTION

India is one of the centers of diversity and origin of banana. Popularly called as 'Kalpatharu' is linked with food medicine, culture, traditions and livelihood of the people. The greater diversity of species in the country is the driving force that determines not only sustainable use of banana resources but also conservation of greater germplasm available locally. With around thousand types of bananas which can be subdivided into fifty groups of varieties (both seed and seedless), there really are a great many different bananas in the world. As banana is cheaper in prize and easily available, everyone can include it in their daily diet and is rightly pointed out as 'Poor man's apple'.

The banana is a strange plant; as a perennial it replaces itself. When the bunch of banana is harvested the mother dies. In fact, it is the pseudo stem which is cut not just the flowering stalk. But before harvesting the mother plant puts out new sideways stalks known as ramifications to ensure her succession. The underground part of the stem (also known as the bulb, stump or rhizome) will send out new shoots and these form the basis of the perennial banana tree. Each shoot can because a fully-fledged banana plant both as the successor to the mother on the same stump, or it can be removed and planted elsewhere. All fruits 'live' and breathe, but they do not all ripen in the same way. The banana is a climacteric fruit meaning it needs a climax, rather than a gradual process to ripen. Like the avocado, pear, mango, apple, and plum, the banana will only ripen if its breathing suddenly intensifies. While it is a still green, the banana starts to produce ethylene. The emission of this gas produces a biochemical reaction which kick-starts a sharp increase in the way the fruit breathes. This kick-start sets off the process of ripening: the starches change into sugars, the tissues soften up, the chlorophyll on the skin is destroyed and the banana turns yellow. The ethylene then escapes from the banana and helps to ripen its neighbours. Nowadays bananas are ripened on demand. They are stocked in ripening halls. The storage temperature varies from 13 to 18 °C, depending on needs, and is checked regularly. The ripening process is set off by releasing ethylene into the air in the ripening chambers.(NBF brochure by CISSA 16-12-2017).

In addition to the general features mentioned above, it also possess some ayurvedic properties. In Ayurveda, ***Musa Paradisiaca*** is cited for treatment of many disorders. Its leaves can be used in the treatment of cough and bronchitis. Roots are used to arrest hemoptysis possess strongly a stringent and as an Anthelmintic. Fruits can increases the renal activities, reduce the risk of kidney cancer. It contains antioxidizer and counter acts the noxious effects of the free radicals. ***Musa Paradisiaca*** can be used as antidote for snake

bite, Asthma, burns, diabetes, dysentery, excessive menstrual flow, fever gangrene, gout, headache, hemorrhage, inflammation, insomnia, intestinal parasites, sores, syphilis, tuberculosis, ulcers and warts. It is also used in diarrhea, stomach aches, and lack of appetite, maintaining bones healthy, gastric ulcer, strengthening the immune system, reducing the risk of hypertension, mental shock and to improve the muscular activity. (Swathi *et al.,* 2011)

Keeping all the above mentioned data, a study is planned to enquire the antioxidant potential of locally available varieties of banana which will bring about the health benefits and potential therapeutic benefits for other applications.

MATERIALS AND METHODS

Study material

The present study is based on the comparison of antioxidants in three Musa species. This study material was selected because of the availability of the most abundant crop in Kerala which belong to musaceae family.

Collection and preparation of sample

The fresh samples of the varieties of musa species including Red banana, Nendran and Rasakadali were collected from the local market of Vattappara Trivandrum district (Kerala state). Well ripened bananas were selected without blemishes and injuries. Bananas were washed under running water, hand peeled and cut into small pieces and macerated for getting pulp. One gram of the pulp was used for the analysis.

ESTIMATION OF ANTIOXIDANTS

Estimation of tannin

Total tannin content was determined by using Folin-Ciocalteu Spectrophotometric method. Palnt extract 0.1ml was added to a volumetric flask containing 7.5ml of distilled water, 0.5ml of Folin-Ciocalteu-Phenol reagent and 1ml of 35% sodium carbonate solution and he content was diluted with 10ml distilled water. The mixture was shaken well and kept at room temperature for 30minutes. Using a set standard solution of gallic acid, a standard curve was prepared. Absorbance for test and standard solutions was measured against blank at 725nm with a UV/Visible spectrophotometer. The tannin content was expressed in terms of 0mg of GAE/g of extract.

Estimation of saponins

Test extract were dissolved in 80% method, 2ml of vanillin in ethanol was added, mixed well and the 2ml of 72% sulphuric acid solution was added, mixed well and heated on a water bath at 60^{o}c for 10minutes, absorbance was measured at 544nmagainst reagent blank. Diosgenin is used as a standard material and compared the assay with Diosgenin equivalent.

Estmation of flavanoids

Total flavanoid content was determined by Aluminium chloride method using catechin as a standard. 1ml of test sample and 4ml of water were added to a volumetric flask (10ml volume). After 5minute 0.3ml of 5% Sodium nitrite, 0.3ml of 10% Aluminium chloride was added. After 6min incubation in room temperature, 2ml of I M Sodium hydroxide was added to the reaction mixture. Immediately the final volume was made up to 10 ml with distilled water, the absorbance of the reaction mixture was measured at 510nm against a blank spectrophotometrically. Results were expressed as catechin equivalents (mg catechin/g dried extract).(Zhishen *et al*.,)

Estimation of phenol

The Folin-Ciocalteu Spectrophotometric method was used for the determination of total content in plant extracts. To a 25ml volumetric flask, 1ml of extract and 9ml of distilled water was taken. 1 ml of Folin-Ciocalteu phenol reagent was added to the mixture. The volume of the same was added to the mixture. The volume of the same was made to 25ml with distilled water. A standard curve was developed using different concentrations of gallic acid(20,40,60,80 and 100 microgram/ml) incubated for 90 minutes at room temperature and the absorbance values for test ans standard solutions were noted against blank at 550nm with a UV/Visible spectrometer. Total phenol content was expressed as mg of GAE/gm of extract.(Singleton *et al*., 1999)

Estimation of alkaloid

To 1ml of test extract 5ml p^{h} 4.7 phosphate buffers was added and 5ml BCG solution and shake a mixture with 4ml of chloroform, the extracts were collected in a 10ml volumetric flask and then diluted to adjust volume with chloroform. The absorption of complex in chloroform. The absorption of the complex in chloroform was measured at 470nm against blank prepared as above but without extract. Atrophine is used as a standard material and compared the assay with atrophine equivalents

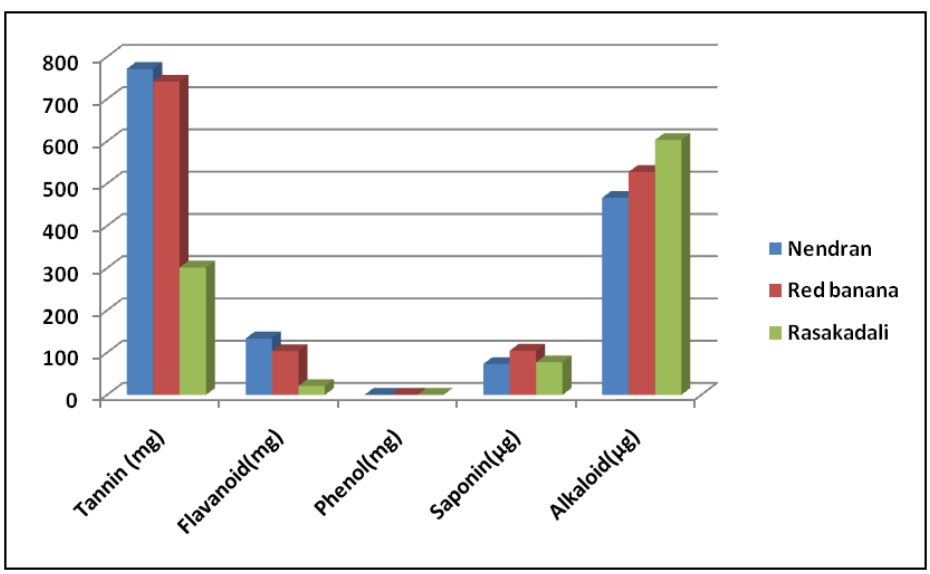
RESULTS AND DISCUSSION

Phytochemicals are naturally occurring, biologically active chemical compounds in plants. In plants, phytochemicals act as a natural defense system for host plants and provide colour, aroma and flavour. Phytochemicals are a group of plant inherent bioactive substances that are responsible for protection of such plants from environmental stress, microbial attack, insects and other external aggression. These phytochemicals are localized to fruit, seed, stem epidermis, flower and other peripheral surfaces of plants (Daramola *et al*.,2011). They can also be called secondary metabolites, and they include flavonoids, alkaloids, saponins, terpenoids, anthraquinone and carotenoids (Trease and Evans., 2002).

The therapeutic values of these secondary metabolites have been harnessed in the treatment and management of public health world over. One of the activities of this group of bioactive constituents is term antioxidant. The importance of antioxidant can be illustrated in the oxidation process phenomenon. Oxidation processes are inevitable in living system; however they are associated with production of free radicals. The free radicals are undesirable in food, drug and living system because they are linked with majority of human diseases notably, ageing, atherosclerosis, cancer, diabetics, liver cirrhosis, cardiovascular disorders etc. They are not essential nutrients and are not required by the human body for sustaining life (Burrello., 2005).

ESTIMATION OF ANTIOXIDANTS (TABLE.1)

	Tannin (mg/g)	Flavanoid (mg/g)	Phenol (mg/g)	Saponin (µg/g)	Alkaloid (µg/g)
Nendran	771.41	133.5	0.156	73.01	466.3
Red banana	741.42	103.4	0.248	104.58	527.39
Rasakadali	301.42	21.1	0.0445	76.96	603.01



Graphical representation (fig.1)

In the current study, the Phytochemical assay revealed the presence of some phytochemicals like phenols, tannins, alkaloids, saponins and flavonoids at varying concentrations. The presence of these phytochemicals confirms the three *Musa* species tested to be of medicinal value. Out of five parameters tested in three sps. of Musa namely Nendran, Kappa and Rasakadali, it was found that Tannin content was far greater when compared to Flavanoid and Phenol in the three varities of musa. Of all the five parameters listed above, Rasakadali exhibited least values. The phenol content in all the banana varieties was considerably low when compared to others.

In a similar work carried out using three stages of development (Immature, Green mature and ripe) by (Ogbonna *et al*., 2016) showed that the pulp of Musa species at the ripe stage contained phenols and saponin in abundance. The quantity of tannins was observed to be high at the immature stages of development of the three Musa species. Alkaloids and flavonoids, were present in moderate quantities while tannin was absent in banana but present in plantain and saba banana, with a higher quantity in plantain. The quantity of each phytochemical in the different species was observed to have increased as fruit develops from immature to ripe stages.

CONCLUSION

Ripe banana is of great nutritional value. Ripe banana health benefits are very varied and so the health benefits of ripe bananas should be taken into account when deciding on a diet plan. Investigations carried out as part of the current work gives an insight about the antioxidant quantity and comparison within and between ripe banana varieties. Reference collected also indicates that, it has a rare combination of energy value, tissue-building elements, protein, vitamins and minerals. Also, it is a good source of calories since it is rich in solids and low in water content as compared to any other fresh fruit. Bananas are a good source of Vitamin C which helps to rebuild the immune system. Bananas are also relatively easy to digest as compared to other foods and so they are invaluable to those with compromised immune systems. Vitamin C also increases the absorption of iron and increases the formation of blood, these two health benefits of bananas make it ideally suited for those with anemia or blood related problems. Bananas can also be included in a diet for high blood pressure as they contain potassium which helps to reduce and control high blood pressure.

The results of the current study indicated high antioxidant in Nendran and less in Rasakadali, in the case of Red banana is minimum.

Banana varieties have attracted considerable global interest in recent years due to their high demand in export market. The diverse pharmacological activities of the species selected also need special mention. The main pharmacological activities of these plant are antilithiatic, antioxidant, antibacterial, antidiabetic, antiulcer, antidiarrhoeal, hypocholesterolaemic, hepatoprotective, anti snake venom, wound healing, hair growth promoting, antifungal and antimenorrhagic activity. Due to the medicinal properties there is enormous scope for future research on Musa Species. It is of great importance to carry out further research to investigate the unexploited potential of this plant for the discovery of safer drugs.

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