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Qualitative Analysis of Macronutrients from Musa spp. Pseudostem watery sap

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Abstract: *Banana (Family Musaceae), one of the largest herbs in the worlds, is the fourth most important global food crop (INIBAP 2001). Banana pseudostem expands rapidly each day and the overlapping, close fitting leaf sheaths contain a series of longitudinal canals of large lacunae filled with air (Skutch 1927, Aubert 1973). Banana pseudostems are crop waste, which cause economic loss and environmental issues after harvest. However pseudostems are rich in dietary fibre and have health benefits. This study explored the chemical composition of Pseudostem watery sap (Carbohydrates, Protein, Amino acids) and anatomy of the pseudostem. The pseudostem is used as a dietary product for fibre source. The watery sap which is the main constituent of pseudostem was experimented with the nutritional content in it. The intension of doing the same was to conclude that not only the fibres but the sap is also nutritionally beneficial.*

The watery sap was extracted from a live grown up plant by inserting a plastic straw in the pseudo stem with about 2-3cm deep and collecting the sap in the plastic bottle. The sap was tested before browning. The untreated sap showed the presence of macronutrients with the chemical test. The qualitative test showed the presence of the nutrients in the watery sap.

Thus the sap can also be considered as nutritionally beneficial as the pseudostem. The juice extracted of the pseudostem by crushing it is also medicinally important. But here in the present study watery untreated sap was taken into consideration.

Keywords: Banana, Pseudostem, dietary, watery sap, chemical composition

I. INTRODUCTION

A research means systematic investigation into and study of materials and sources in order to establish facts and reach new conclusion. In recent years, people have placed a high emphasis on forest preservation and rational use of forestry and agricultural residues. This trend is mainly motivated and accelerated by the dilemma of an ever increasing consumption fibre based products like *Musa cavendish* pseudo stem and relative products (Kun li, et-al. 2010, Analysis of the chemical composition and morphological structure of *Musa cavendish* pseudo-stem)

Musa cavendish (family Musaceae), one of the most largest herbs in the world, is the fourth important global crop (INIBAP, 2001). It is generally accepted that *Musa cavendish* need large amount of water for high production; (Stover and simmonds, 1987; Diczbalis and toohill, 1993). However, it is difficult to quantify water use in the *Musa cavendish* plants and the basic values are understood.*Musa cavendish* plant contain a flattened, modified stem is called the pseudostem consisting of concentric layer(Estimation of whole plant transpiration of *Musa cavendish* using sap flow measurement, journal of experimental botany , vol.53, no 375, August 2002)

In general, *Musa cavendish* pseudo-stem is an abundant natural resource in subtropical and tropical region and has potential for providing profitable products such as manure(Ultra et al.2005) and feed (Ulloa et al. 2004), which call for practical techniques and processes to exploit this natural resources. *Musa cavendish* is a herbaceous plant of the genus Musa spp. of the family Musaceae. *Musa cavendish* is one of the most widely grown tropical fruits because of its high food value and an important addition to the diet. In Malaysia, the production of commercial varieties of *Musa cavendish* has increased by 24–27% over the decades giving an amount of 27,453 hectares in 2009 with Johor, Pahang, and

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Sarawak as the largest *Musa cavendish* producing states. The stem from which the fruit bunches have been taken should be cut off because it will never again grow fruit. The stem will be left abundantly in the plantation and normally will just rot or be used as fertilizer(Research Article: A Preliminary Study of *Musa cavendish* stem Juice as a Plant-Based coagulant for treatment of Spent Coolant Wastewater,Habsah Alwi,1 Juferi Idris,2 Mohibah Musa,1 and Ku Halim Ku Hamid)

To study the nutritive contain in *Musa cavendish* stem water which is naturally occurring substance in stem many methodology can be used in this research. With reference to normal nutritive contain in water, the tests can be done. Qualitative analysis of carbohydrate, proteins and amino acids tests should be done in this research (QUALITATIVE ANALYSIS FROM CLASS 12 THEORY). Anatomy of stem is well studied in article (THE BOTANICAL GAZTTE, Alexander skutch, 1932).The pseudostem is the part of the plant that looks like a trunk. This false stem is covered by the tightly packed overlapping leaf sheaths. The pseudo stem continues to grow in height as the leaves emerge one after the other and reaches its maximum height when the aerial stem emerges at the pot of the plant. Even though the pseudo stem is very fleshy and consist of water, it is quite sturdy and can support a bunch that weighs 50kg or more (morphology of the *Musa cavendish* plant, www.promusa.org). The *Musa Cavendish* pseudostem expand rapidly each day and the overlapping, close fitting leaf sheaths contain a series of longitudinal canals of large lacunae with air (Skutch,1927;Aubert, 1973).

(Investigation water transport through the xylem network in vascular plant, journal of experimental Botany volume 65 issue 7, 1 April 2014) In land plants, water and minerals are taken up from the soil by the roots and transported through the xylem network to the leaves. Some tree can lift water over a distances of more than 100 meters from the roots to the uppermost leaves (Ryan *et al*., 2006). This ability has fascinated scientists through the centuries and the study of plant hydraulics remains an active topic of research open to new method of investigation (Tyree,2003). The total water requirement of *Musa cavendish* plant is about 900-1200 mm for its entire life cycle and this can be met both through natural precipitation(rainfall) as well supplementary irrigation(Expert system of *Musa cavendish*, www.agritech.tnau.ac.in)

In civilized society, drought are thought of more as inconvenience threat; however, in a disaster scenario, the threat of drought especially in times of extreme heat- becomes much more real when clean drinking water is a scarce resource. If there are green plants, there is water to be harvested. *Musa cavendish* is non poisons plant and it has high water holding capacity. In drought condition we collect water from *Musa cavendish* plant using straw and bottles (you tube.com with caveman cody).

The pseudostem of *Musa cavendish* have three different types of sap namely watery sap, milky sap and red purple sap. But to study the qualitative analysis of pseudostem watery sap is chose because it is drinkable and harmless. Pseudostem sap has been extracted from the outer sheath of pseudostem of banana tree. It looks like colourless clean water immediately but after extraction. However , with the time passage, its slowly turns into a light yellow colour due to oxidation of phenolic rings present it in(Banana pseudostem sap: an important agro waste for diversified application including textile).

II. MATERIALS AND METHODS

Materials :

Musa Cavendish plant:

Musa cavendish is the largest rhizomatous herbs in the world, it is the fourth important global food crop. It has a high water requirement. All the above ground parts of the *Musa cavendish* plant grow from a structure usually called a “corm”. Plants are normally tall and fairly sturdy, and are often mistaken for trees, but what appears to be a trunk is actually a “false stem” or pseudo stem.

Collection method:

For collection of water *Musa cavendish* (Musa sp.) were collected from plantation in Dapoli (Jalgaon). The hight of the plant is nearly about 3 to 4 ft and diameter of the stem is about 40 to 30 cm. The colour of outer bark is greenish

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yellow in colour. For collection of water, straw is inserted into the stem with the help of knife. The water was collected in dark bottle after 24 hrs the quantity was 15 ml. After collecting water it was tested for different qualitative analysis.

Methodology for qualitative analysis of *Musa cavendish* stem water:

Qualitative analysis of amino acid:

Xanthoproteic test:

Procedure:

Take 2 ml of water in test tube and boil, add equal volume of concentred HNO3

Heat over a flame and observe the colour

Yellow ppt

Now cool thoroughly under the tap cautiously run in sufficient 40% NAOH to make the solution strongly alkaline

Yellow changes to orange

Qualitative analysis of carbohydrates:

MOLISCH'S TEST:

Molisch's Test is a sensitive chemical test for all carbohydrates in a combined form, based on the dehydratation of the carbohydrate by sulphuric acid to produces an aldehyde (either furfural or a derivative). Which then condenses with the phenolic structure resulting in a red or purple-colored compound.

Procedure:

Place 2ml of a known carbohydrate solution in a test, add 1 drop of Molisch's reagent(10% α- naphthol in ethanol)

Pour 1-2ml of conc H2SO4 down the side of the test tube, so that it forms a layer at the bottom of the test tube.

Observe the colour at the interface between two layers and compare result.

Carbohydrate as reducing sugars:

Most commonly used tests for detection of reducing sugars are Fehling's test, Benedict's test and Barfoed's test.

Fehling's test:

Fehling's test is one of the sensitive test for detection of reducing sugars. It comprises of two solution Fehling's A and B. Fehling's A is aqueous copper sulphate and Fehling's solution B alkaline sodium potassium tartarate, it is acts as chelating agent in this reaction.These two solution mixed in equal amount before test. On heating with an aldehyde or reducing sugar with Fehling's solution gives reddish brown precipitate. It denotes presence of reducing sugar.

Procedure:

To 1 ml of Fehling's solution A(aqueous solution of $CuSo_4$) add 1 ml Fehling solution B (solution of potassium tartarate) .

Add 2 ml of sugar solution mix well and boil.

Try to see the red precipitate of cuprous oxide that forms at the end of the reaction.

Test for proteins:

Biuret test:

The Biuret test positively identifies the presence of proteins (not less than two peptides). The reaction in this test involves the complex formation of the proteins with Cu_2^+ ions in a strongly alkaline solution. Apply this test to solution.

Procedure:

To 2ml solution add 5-6 drops of dilute CuSO4 (Fehling's solution A diluted with 1/10 with water)

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Add 3ml 40% NaOH solution.
Biuret reagent.
Observe the colour change.
Transparent colour is changes to the blue with crystals and it is soluble in water.

Observation table:

Test	Procedure	Observation	Result
Xanthoproteic test	2 ml of test solution+ concentrated nitric acid+ 40% NaOH	Yellow ppt changes to orange	Amino acid present
Molisch's test	2 ml of test solution+ 1drop Molisch's reagent+ 1-2 ml of concentrated sulphuric acid	Two layers are form	Carbohydrate present
Benedict's test	Benedict's reagent+ Banana extract+ boil for 2 min + shake+ brick red precipitation is form .	A brick red precipitation is form	Glucose reducing sugar of carbohydrate is present.
Fehling test	1 ml of test solution+ 1 ml of Fehling A and B + boil for 2 min	Precipitation is form	Reducing sugar of carbohydrate is present (sucrose)
Biuret test	2 ml of test solution+ 5-6 drops of dilute $CuSO_4$ + Fehling solution A+ 40% NaOH + Biuret reagent	Transparent colour changes to blue crystals and it is soluble in water	Proteins present

III. CONCLUSION

The three major macronutrients are relatively analysed in the watery sap of pseudostem using chemical methods which are the standard methods for estimation. The presence of macronutrients gives us the idea of nutritional content of the sap. The sap can also be used for the fulfillment of nutritional needs when an individual is deficient in it. As we all know that the pseudostem is the major environmental waste when the plant is cut down. The juice is therefore extracted from the stem but without harming the plant, the sap can also help to fulfill the needs of nutrition.

IV. DISCUSSION

The experimental material used is the watery sap of pseudostem, the reason to choose the above material was, there are several research papers published on the dietary effect of pseudostem juice which is extracted by squeezing the pseudostem, here the stem was not squeezed. The extraction procedure was harmless to the plant. It is already proven that juice of the pseudostem is rich in nutrients, but aim was to prove the richness of watery sap. The macronutrients carbohydrates, proteins and amino acid are qualitatively estimated. Further scope for research would be qualitative analysis of the macronutrients and comparison with the nutrient contain of the juice of pseudostem.

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REFERENCES

[1]. "A preliminary study of Banana pseudostem juice as a plant based coagulant for treatment of spent coolant wastewater". Journal of chem., volume 2013 article ID 165057, 7 pages. Habash Alwi, Juferi Idris 2, Mohibah Musa, and Ku Hamid.

[2]. "Anatomy of Banana Stem" Journal of Biology. January 2001., RonaldsEnnos, H.ch. Spatz, Thomas Speck.

[3]. " Anaerobic digestion of Banana stem waste" Article in Bioresource tech 73(2) ., 191-193 page, June 2000., V.C.Kalia, V.Sonakya, N.Raizada.

[4]. "A study of Musa paradisiacal Pseudostem pith fluid as set retarding admixture" Emirates journal for plants., pages 11-18 in 2014 by A.A. Umon

[5]. "Banana pseudostem characterization and its fibre property evaluation physical and bioextraction" 01 September 2011 by J.S.Jayaprabha, V.B. Manilal, M. Brahamakumar.

[6]. "Banana and its biproduct utilization: an overview." Journal scientific and industrial research,69: 323-329Mohapatra, D., Mishra, S and Sutar, N.2010.

[7]. "Banana-raw materials for making processed food products". Trends in food science technology, 20:78-91. Aurore, G., Parfait, B. And Fahasmane, L2009.

[8]. "Chemical composition and pulping of Banana pseudostems". India crops production, 19:147-154. Corderio, N.,Belgacem, M.N. Torres, I.C. and Moura, J.C. V. P. 2004.

[9]. " "Health benefit of Banana stem juice" April 9,2015.

[10]. " Importance of Banana stem juice water" quora.com 14 Nov 2016.

[11]. "Roots and Implications for Nematode Resistance in Banana(Musa spp.)" in San José (CRI),Nov3-5; INIBAP:International Symposium Wuyts, N.; Lognay, G.; Sagi,L.;Waele,D.D.;Swennen,R.SecondaryMetabolites Montpellier, France, 2005; pp 238-246.

[12]. "Pulp and paper from 'Dwarf Cavendish' pseudo-stems,"Cordeiro N., Belgacem M. N., Chaussy D., and Moura, J. C. V. P. (2005). Cellulose Chemistry Technology. 39, 517-529.

[13]. "Qualitative analysis of carbohydrates"www.chem.boun.edu.tr>2014/04

[14]. "Phenolic compounds in cultivated plants: ecologic functions, health implications, and modulation by pesticides. Environ. Health Perspect."1999,107 (Suppl. I), 109–114.Daniel,O.;Meier,M.S.;Schlatter,J.; Frischknecht,P

[15]. "Synthesis and characterization of sodium carboxymethylcellulose from cavendish banana pseudo stem"Adinugraha, M. P., Marseno, D. W., and Haryadi. (2005). (Musa cavendishii LAMBERT)," Carbohydrate Polymers 62(2), 164-169.

[16]. "Status of banana production in Bangladesh, Proceedings of international Conference on Mechanical Engineering Dhaka, Bangladesh" journal of ICME 05-AM-47, 33-41. Islam, S.M. and Hoque, M.A.2005.

[17]. "Testing of lipids, proteins and carbohydrates".Science and health education partnership. University ofCallifornia. By SANFransisco and SEP Lessons.

[18]. "Usefulness of Banana (Musa paradisiaca) wastes in manufacturing of Bio-products."A scientific journal of krishi foundation. The agriculturists 12(1): 148-158(2014) ISSN 2304-7321(online) A.K.M. Mohiuddin