Journal of Advances and Scholarly Researches in Allied Education

Vol. X, Issue No. XIX, July-2015, ISSN 2230-7540

REVIEW ARTICLE

ANALYSIS AND REVIEW ON BY-PRODUCTS OF BANANA

AN INTERNATIONALLY INDEXED PEER REVIEWED & REFEREED JOURNAL

www.ignited.in

Journal of Advances and Scholarly Researches in Allied Education
Vol. X, Issue No. XIX,July-2015, ISSN 2230-7540

Analysis and Review on By-Products of Banana

Dr. Shivanand S. Hiremath

Subject Matter Specialist Plant Protection, ICAR Kle Krishi Vigyan Kendra Belgaum

----------X----------

The banana is a consumable natural product, organically a berry, created by a few sorts of expansive herbaceous blossoming plants in thegenus Musa.[3] In a few nations, bananas utilized for cooking may be called plantains. The natural product is variable in size, shading and immovability, however is generally prolonged and bended, with delicate tissue rich in starch secured with a skin which may be green, yellow, red, purple, or cocoa when ready. The organic products develop in groups swinging from the highest point of the plant. All cutting edge edibleparthenocarpic (seedless) bananas originate from two wild species – Musa acuminata and Musa balbisiana. The logical names of most developed bananas are Musa acuminata, Musa balbisiana, and Musa × paradisiaca for the mixture Musa acuminata × M. balbisiana, contingent upon their genomic constitution. The old logical name Musa sapientum is no more utilized.

Musa species are local to tropical Indomalaya and Australia, and are prone to have been initially trained in Papua New Guinea.[4][5] They are developed in no less than 107 countries,[6] essentially for their organic product, and to a lesser degree to make fiber, banana wine and banana lager and asornamental plants.

Around the world, there is no sharp qualification in the middle of "bananas" and "plantains". Particularly in the Americas and Europe, "banana" more often than not alludes to delicate, sweet, dessert bananas, especially those of the Cavendish bunch, which are the fundamental fares from banana-developing nations. By complexity, Musa cultivars with firmer, starchier organic product are called "plantains". In different districts, for example, Southeast Asia, numerous more sorts of banana are developed and eaten, so the straightforward twofold refinement is not valuable and is not made in nearby dial

Banana is the second biggest created organic product after citrus, contributing around 16% of the world's aggregate natural product production1 (Table 1). India is biggest maker of banana, adding to 27% of world's banana creation. By chance, generation of banana in India has surpassed mango creation. In India2, Tamil Nadu is the main maker of banana, trailed by Maharashtra (Table 2).

Organic Evolution and Nomenclature of Banana Plant

Banana is a standout amongst the most broadly developed tropical organic products, developed more than 130 nations, along the tropics and subtropic of Capricorn. Consumable bananas are gotten from Australimusa and Eumusa arrangement, which have diverse starting points from same family. A large portion of the consumable bananas are either gotten exclusively from Musa accuminata or are half and half between two wild diploid species, M. acuminata Colla and M. balbisiana Colla; which added to An and B genomes, separately. Plant has a starting point from India and eastern Asian district (Malaysia and Japan) and a few assortments are observed to be hereditarily connected with a few animal groups from Africa. Polyploidy and hybridization of An and B genomes has offered ascend to diploid (AA, AB, BB), triploid (AAA, AAB, ABB, BBB) and tetraploid (AAAA, AAAB, ABBB, AABB) bananas. Various other varieties also exist naturally or developed by hybridisation of these genomes, which have different nomenclatures[3,4]. Three common species of Musa (*M. cavendishii*, *M. paradisiaca* and *M. sapientum)* are widely grown in the world. *M. cavendishii,* pure triploid acuminate (AAA group) known as dessert banana, is sweeter and less starchy than *M. paradisiaca*, while *M. sapientum,* known as true banana, is usually eaten raw when fully mature. Both *M. paradisiaca* and *M. sapientum* belong to AAB group [5] and are characterized by higher starch concentration compared to pure acuminate group. Cooking banana falls under ABB (*Pisang Awak, Bluggoe*) and BBB (*Saba* banana) group and has predominant *M. balbisuana* genes[4]. There is a great diversity of dessert bananas in terms of plant stature, fruit size and colour (yellow, green, red, and orange), namely *M. nana Lour* for Dwarf Cavendish, *M. rubra* Firming von Wall for red banana, *M. corniculata Lour* for horn plantain, and many others[4,6]. Most productive cultivars[7] are Cavendish bananas and giant French plantains (productivity value, >30 t/ha/yr). Out of over 50 varieties of banana cultivated across India, 20 are commonly grown (Table 2). This paper reviews dessert bananas, belonging to both AAA and AAB groups. diploid (AA, AB, BB), triploid (AAA, AAB, ABB, BBB) and tetraploid (AAAA, AAAB, ABBB,

AABB) bananas. Different assortments likewise exist normally or created by hybridisation of these genomes, which have distinctive nomenclatures3,4. Three basic types of Musa (M. cavendishii, M. paradisiaca and M. sapientum) are broadly developed on the planet. M. cavendishii, immaculate triploid sharpen (AAA bunch) known as pastry banana, is sweeter and less boring than M. paradisiaca, while M. sapientum, known as genuine banana, is normally eaten crude when completely develop. Both M. paradisiaca and M. sapientum fit in with AAB gathering 5 and are portrayed by higher starch fixation contrasted with immaculate taper bunch. Cooking banana falls under ABB (Pisang Awak, Bluggoe) and BBB (Saba banana) amass and has prevalent M. balbisuana genes4. There is an extraordinary differing qualities of sweet bananas as far as plant stature, natural product estimate and shading (yellow, green, red, and orange), to be specific M. nana Lour for Dwarf Cavendish, M. rubra Firming von Wall for red banana, M. corniculata Lour for horn plantain, and numerous others4,6. Most beneficial cultivars7 are Cavendish bananas and monster French plantains (profitability esteem, >30 t/ha/yr). Out of more than 50 assortments of banana developed crosswise over India, 20 are generally developed (Table 2). This paper surveys dessert bananas, having a place with both AAA and AAB gatherings.

Table 1— Production statistics (2008) of some major fruits of World[1]

Fruits	Production, tonnes	Share of total fruit production, %
Apple	43255520	12.85
Banana	81253358	15.25
Citrus (total)	115550435	23.14
Coconut	43714344	10.95
Grape	55271575	13.25
Orange	53905043	12.79
Lemon and lime	13032388	2.51
Peaches and nectarines	17457087	3.49
Pear	20105583	4.02
Plantain	34444795	5.89
World fruit production excluding melon	499711349	-

Table 2— Statewise banana production in India during 2009-10[2]

State	Production quantity, tonnes	Production share,%	Major varieties grown
Andhra Pradesh	4244.4	9.7	Dwarf Cavendish, Robusta, Poovan, Rasthali, Chakkarekeli, Thellachakkarekeli, Karpoora Poovan, Monthan, Amritpant
Assam	710.9	2.5	Jahaji (Dwarf Cavendish), Chini Champa, Malbhog, Borjahaji (Robusta), Honda, Manjahaji, Chinia, Kanchkol, Bhimkol, Jatikol, Digjowa, Kulpait, Bharatmoni
Bihar	1629.4	5.7	Dwarf Cavendish, Alpan, Chinia, Chini Champa, Malbhig, Muthia, Kothia, Gauria Thellachakkarekeli, Karpoora Poovan, Monthan, Amritpant
Gujarat	4177.7	14.5	Dwarf Cavendish, Srimanti, Mahalaxmi, Mahabanana, Locatan, Harichal G-9, Basrai
Jharkhand	51.5	0.2	Basrai, Singapuri
Karnataka	1514.4	5.5	G-9, Elaki, Dwarf Cavendish, Robusta, Nendran, Poovan, Monthan, Elakkibale
Kerala	494.9	2.1	Nendran, Palayankodan, Rasthali, Monthan, Red Banana, Robusta
Madhya Pradesh	788.2	4.4	Basrai
Maharastra	4952.9	21.4	Grand Naine, Dwarf Cavendish, Basrai, Robusta, Lal Velchi, Safed Velchi and Nendran
Orissa	297.1	1.4	Dwarf Cavendish, Robusta, Champa Patakapura (Rasthali)
Tamil Nadu	6115.5	25.4	G-9, Robusta, Virupakshi, Red Banana, Povan, Elakki, Rastali, Robusta, Karpooravalli, Sakkai, Matti, Red Banana, Peyan
West Bengal	992.2	4.8	Dwarf Cavendish, Mortaman, Champa,Amrit Sagar, Singapuri, Chini Champa, Giant Governor, Singapuri
Others	945.8	4.2	-

Proteins

Bananas protein (1-2.5%), contingent upon genome sort, assortment, height, and climate19,20, increments over aging process21 (4.8-4.2%).

Fat

Fat substance in mash remains verging on steady (1%) amid aging procedure. Peel contains lipid (2.2-10.9 %) and is rich in polyunsaturated unsaturated fats, especially linoleic corrosive and α-linolenic acid22.

Pectins

Ready mash contains pectin (0.7-1.2%). Amid maturing, insoluble protopectin is changed over into solvent pectin that causes relaxing of cell divider and composition corruption prompting softening of fruit24,24

Phenolic Compounds and Pigments

Bananas are rich in phenolic mixes and flavanoids, which have cell reinforcement properties. Astringent taste of unripe banana is because of phenolic mixes. Bananas are rich in dopamine, an antioxidant25,27. Sautéing is brought about by polyphenol oxidase, monophenol monooxygenase and o-diphenoloxidase exercises on dopamine, which delivers tannins

bringing about cocoa spots on peel. At the point when put away underneath 14°C, cocoa patches create on peel28. Polyphenol substance (24.4-72.2 GAE/100 g) for Cavendish banana, demonstrates high cancer prevention agent activity27.

Banana peel is green when completely develop, bit by bit turns yellow and now and again cocoa spots are found. Comparable changes likewise saw in mash.

β-carotene (40-4950 □g/100g), found in mash and peel of natural product, may clarify shading changes from grayish, yellow and, now and again, orange shade of pulp29,40. In any case, change in peel shading is to a great extent because of corruption of chlorophyll or unmasking of carotenoids41,42, instead of carotenoid combination.

Vitamins and Minerals

Mash is rich in vitamin A, B-vitamins (thiamine, 40 □g; riboflavin, 70 □g; niacin, 510 □g; pantothenic corrosive, 280 □g; pyridoxine, 470 □g; folic corrosive, 24 □g) and ascorbic acid44. Potassium is most rich mineral present in consumable segment of banana, trailed by magnesium, calcium, and phosphorus (Table 4). Measure of iron is high, while copper is found in little amount. Because of its nutritive worth, prepared banana when went with some vegetable based items, can be served as amazing child nourishment and nibble food44.

Employments of Other Parts of Banana Plant

Musacea plants can be utilized to produce vitality through decomposition45, and utilized as great treating the soil material45. Banana waste materials are rich in supplements and minerals47,48.

Banana Peel

Banana peel is a rich wellspring of starch (4%), rough protein (5-9%), unrefined fat (4.8-11%)24.

(44.2-49.7%), and polyunsaturated unsaturated fats, especially linoleic corrosive and α-linolenic corrosive, pectin, vital amino acids (leucine, valine, phenylalanine and threonine), and micronutrients (K, P, Ca, Mg)22. With the exception of lysine, substance of all crucial amino acids are higher than FAO standard. Development of organic products includes, increment in solvent sugar, diminish in starch and hemicelluloses, and slight increment in protein and lipid content. Debasement of starch and hemicelluloses by endogenous proteins might clarify expansion in dissolvable sugar content22. Skins can likewise be used for extraction of banana oil (amyl acetate)11 that can be utilized for nourishment seasoning. Banana peels are additionally a decent wellspring of lignin (5-12%), pectin (10-21%), cellulose (7.5-9.5%), hemicelluloses (5.4-9.4%) and galactouroninc corrosive. Pectin extricated from banana peel additionally contains glucose, galactose, arabinose, rhamnose, and xylose24. Micronutrients (Fe and Zn) were found in higher focus in peels contrasted with pulps49. Along these lines, peels could be a decent sustain material for steers and poultry24,40-42

Banana Leaves and Sheaths

Leaves are utilized broadly to weave wicker bin, mats, nourishment wrapper for advertising and cooking, covers over sustenance, tablecloths, and plates for eating and additionally glass for drinking soup. Old leaves are utilized as a part of wrapping up banana groups (cluster spreads) for assurance against bats and fowls. Provincial individuals utilize extensive leaves of triploid bananas as umbrella amid blustery season51. Dried banana leaves are utilized as fuel, and substrate to develop shellfish mushrooms52. In India (Orissa, West Bengal and Kerala), individuals use banana leaves for conventional custom and rituals and roasting so as to plan unique dishes or steaming fixings wrapped in banana clears out. Customarily, in banana developing zones of India and Sri Lanka, individuals take nourishment on banana clears out. Banana leaves are likewise a decent wellspring of lignin (127 sa), which is higher than banana pseudostem (107 sa). Leaves can be given to ruminants with expansion of some protein separate for better digestibility54. Waste materials from banana plant (leaf cutting edge, flower stalk, leaf sheaths and rachis) are inadmissible for pulping because of generally high measure of fiery remains content (19-27%). Great measure of pentosans are available in petiole, leaf sharp edge, and leaf sheaths. Protein content in leaf cutting edge is substantial47,48 and subsequently could be perfect for steers bolster.

Banana Pseudostem, Pith and Male Bud

Different items like chips, fig, prepared to serve drink, flour, jam, sugary treats, got dried out cuts, and pickles can be produced using male bud, youthful foods grown from the ground stem. Paper board, tissue paper, and so on., can be arranged out of banana pseudo stem. Banana filaments can be utilized as normal sorbent, bio-remediation specialists for microscopic organisms in characteristic water purifier, for mushroom generation, in painstaking work and materials when blended with paddy straw. It is likewise utilized as a part of creation of marine cordages, great paper cardboards, tea sacks, string, top notch fabric material, paper for coin notes, and great rope for tying purposes. Filaments from pseudo stem, leaf sheath and rachis are utilized as a part of making fiber based items. Pseudo stem fiber groups have higher particular quality modulus and lower strain at break than leaf sheath and rachis fiber

packs, having qualities practically identical to other lignocellulosic filaments. Banana fiber being a characteristic sorbent has high potential in engrossing spilled oils in refineries51,52,44. With genuinely low measure of fiery remains and lignin and high measure of holocellulose, pseudo stem and petioles are suitable for pulping in paper industry. Banana and banana pseudo stem contain pathogenesis-proteins55 having antimicrobial properties. Lectins, found in banana plant tissues, can be adequately utilized for human consumption55,57. Pseudo stem can be reused to be utilized as bio-fertilizer58. It contains great measure of cellulose and starch and can be utilized as cows feed54. External covering of pseudostem is for the most part cellulosic material while center or essence is rich in polysaccharides and other follow components yet bring down in lignin content47. Waste banana essence can be utilized as shading retentive as a part of wastewater containing material dyes59-51. Substance is utilized as sustenance subsequent to bubbling and expansion of flavors in numerous parts of India. Banana sheath (Composition: dry matter, 5.4; rough protein, 4.4; unrefined fiber, 41.4; cellulose, 44.5; hemicelluloses, 15.5; and lignin, 5%) can be a suitable food for ruminant52. Botanical stalk contain high measure of starch (25%) and can be utilized as a part of pharmaceutical and nourishment industry47,48. Glucose is plenteous in the vast majority of the plant parts with the exception of rachis. Sucrose can be gotten from banana through saccharification54. In Malaysia and India, male bud is cooked and expended as vegetable44,55. Juice from male bud of banana gives solution for stomach problems52.

CONCLUSIONS

Entire banana plant is valuable in sustenance, sustain, pharmaceutical, bundling, and numerous other modern applications. In India, a number of the social and religious services require entire banana tree, aside from leaves and natural products. Product of this plant is a rich wellspring of starch, cancer prevention agents, as well as a decent wellspring of mineral, particularly potassium and iron, a perfect sustenance for weaning mother and newborn children. Peel is rich in vitamins, pectin, sugar, and lignin and can be utilized as steers food, base material for liquor creation, biogas generation and for pectin extraction. Fiber acquired from banana pseudostem and sheath can be used as biodegradable tying ropes. Substance can be used as shading safeguard and even as nourishment when appropriately prepared. Leaves are great lignocellulosic source and have assortments of employments from food to wrapping materials for specific nourishment item and even as thatching material in banana developing spots. Aside from starch recouped from plant, squeeze too has nutraceutical properties and has a potential use in pharmaceutical industry.

REFERENCES

1. Sellular Agro Virtual Study Volume 1, 298, 2010
2. Horiculture world : Indian Field and Framing 2009
3. Aieer 2009, volume 35
4. Imcrtc, Vells, 2010
5. Successor in Agriculture, Deminish Study Volume 2009