Monograph

Musa acuminata

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Musa acuminata, popularly known as banana, is a fruit that is very resourceful and has many uses in our daily lives, more than you can imagine. Chapter one talks about its ecology. It grows in tropical or subtropical areas The normal climate for *Musa Acuminata* is a mean temperature of

80°F (26.67°C) and mean rainfall of 4 in (10 cm) per month. There should not be more than 3 months of dry season. Most of the times they are attacked by parasites or worms causing the plant to rotten. This crop is principally grown in humid or tropical region. The World production of Musa Acuminata is estimated to be 28 million tons. Chapter 2 talks about its biology. *Musa acuminata* can be cultivated with our without seeds, but with different constitutions and uses. bananas usually bear fruit several times a year and plants usually die after inflorescence Wild banana has a high effectivity in case of growing since it rapidly occupies on any soil. The process of fruiting is approximately four months for flowers to develop into fruits. Chapter 3 is mostly about propagation and management. Banana natural regeneration is very slow. Bananas are propagated vegetative rather than sexually because nearly all cultivated varieties are seedless. Bananas can develop without the need of seeds. Chapter 4 is about *Musa* acuminata's potential markets The banana economy is very important globally because it first gives money to exporting countries and it gives employment to thousands and hundreds of people in Latin America, Caribbean, Southeast Asia and Africa. Banana industry created huge distribution networks and supermarkets worldwide. The last chapter is chapter 5: Medicinal and traditional non-wood uses. Bananas help lower blood pressure and reduce the risks of cancer and asthma. Bananas are rich in a mineral called potassium. What potassium does is that it helps maintain fluid levels in the body. It helps regulate nutrients and waste products found in cells. Also helps muscles to contract and nerve cells to respond. It also helps blood pressure to stabilize. One medium-sized banana contains 422 milligrams of potassium.

Chapter 1: Ecology

1.1 Ecology

Recommended Temperature Zone:

sunset: 21-27

Frost Tolerance: Leaves are damaged at 32°F (0°C), plant will grow back from the root (corm)

Sun Exposure: Full sun to light shade depending on the variety

Origin: Southeast Asia, Australia

Growth Habits: Perennial from 3 to 8 feet depending on variety

Watering Needs: Abundant water

Propagation: Offsets

Musa acuminata grows in tropical or subtropical areas. The temperature it grows in average 80 degrees. The quantity of water they need per month of rainfall is 4 inches. They can't be in dry season for more than 3 months. Frosting can kill the plant, and winds also damage this crop by changing its metabolism or uproot the plant. They can grow in poor soil, taking in mind the soil is deep and well irrigated. Most of the times they are attacked by parasites or worms causing the plant to rotten. They have parasites such as: *Cosmopolites sordidus Meliodogyne javanica* Black Sigatoka. The black sigatoka is epidemic and it is needed many pesticides to kill them.

1.2 Distribution:

Musa acuminata, is the 4th largest fruit crop of the world, following the grape, citrus fruits and the apple. *Musa acuminata* principally originated in the Indo-Malaysian region and Australia. The where carried to Europe in the 10th Century, in the 16th Century, Portuguese transported the plant from the West African coast to South America.

This crop is principally grown in humid or tropical region. The World production of Musa Acuminata is estimated to be 28 million tons—65% from Latin America, 27 % from Southeast

Asia, and 7 % from Africa. Just a fifth of what is harvested is exported to Europe, Canada, the United States and Japan as fresh fruit.The main producer in asia is India is the leading producer as well globally. The crop from 400,000 acres is for domestic means. *"Indonesia produces over 2 million tons annually, the Philippines about 1/2 million tons, exporting mostly to Japan. Taiwan raises over 1/2 million tons for export. Tropical Africa grows nearly 9 million tons of bananas each year and exports large quantities to Europe."*

In South America, Brazil is the leading banana grower, they produce about 3 million tons per year, but most of it is consumed locally, while Colombia and Ecuador are the leading exporters. Large scale commercial production for export to North America is concentrated in Honduras and Panama and way behind in third place is Costa Rica.(ch 2016)

Environmental factors affecting distribution:

- Elevation
- Climate
- Rainfall
- Temp regime
- Geology and soils
- Toposequence
- Evatrasporation

According to the FAO agriculture, The edible bananas (Musa Acuminata) should be located in regions that are tropic or subtropic, should vary between latitudes 30°N and 30°S. It is important to take in mind as well its different seasons, temperature, grades of precipitation. The normal climate for Musa Acuminata is a mean temperature of 80°F (26.67°C) and mean rainfall of 4 in (10 cm) per month. There should not be more than 3 months of dry season.

Cool weather and prolonged drought retard growth. It is important to take in mind the temperature they grow in. Take as an example, plants produce only one leaf per month in winter, 4 per month in summer. when low temperatures occur at flowering time, the leaf may not leave from the stem. If there is already some fruit formed in the leaf, maturity of the fruit will be delayed by months or it may stop its maturity process. Now, If only the leaves die, the fruits will be uncovered and exposed tos un, which will cause sunburn. If there is a period of no rainfall, Flooding the field in advance of a cold snap will keep the ground warm if the chill weather is brief. In countries like Australia, this crop is planted on places where it is very sunny at elevations of 200 to 1,000 ft (60 to 300 m) to avoid the cold air that settles at lower levels. When there is short frosts it may kill the plant to the ground but will not destroy the corm. "*Wind is detrimental to banana plants. Light winds shred the leaves, interfering with metabolism; stronger winds may twist and distort the crown. Winds to 30 mph break the petioles; winds to 40 mph will topple a pseudostem that is supporting the weight of a heavy bunch unless the stem is propped, and may cause root damage in non fruiting plants that are not blown down; winds of 60 mph or over will uproot entire plantations, especially when the soil is saturated by rain." (ch 2016)*

To prevent these wind factors, windbreaks are placed around banana fields prevent cold and wind. Cyclones and hurricanes are the main factor of many countries not growing this crop, and it is why in the West Indies to Central America, Colombia and Ecuador it is so successful.

Hail is a major damage factor to Musa Acuminata, powerful convection currents in the tropics mostly on spring cause damage to banana. The advantage with Musa Acuminata and in general the banana plant is that they will grow and fruit under very poor conditions and damaged soil, but will not flourish or be domestic without deep, well-drained soil—loam, rocky sand, marl, red laterite, volcanic ash, sandy clay, even heavy clay—but not fine sand which holds water. This crop grow better in an acid soil but if the pH is below 5.0 lime should be applied the second year. This is also because the lower pH makes bananas more susceptible to Panama disease.

1.3 Vegetation components:

1.3.1Pests

This are the top most common pests found in *Musa acuminata.* There can be other pests as well, but may vary depending on the location. This are the most common pests around the world and the ones that mostly affect the crop.

Wherever bananas and plantains are grown, nematodes are a major problem. In Queensland, bananas are attacked by various nematodes that cause rotting of the corms: Plantains in Puerto Rico are attacked by 22 species of nematodes. The most lethal of them all is the burrowing nematode and it is the cause of the common black headtoppling disease on land where plantains have been cultivated for a long time. Nematicides, properly applied, will protect the crop. Otherwise, the soil must be cleared, plowed and

exposed to the sun for a time before planting. Sun destroys nematodes at least in the upper several inches of earth. Some fields may be left without cropping for as long as 3 years.

The black weevil, *Cosmopolites sordidus*, also called banana stalk borer, banana weevil borer, or corm weevil, is the second most destructive pest of bananas and plantains. It attacks the base of the pseudostem and tunnels upward.

The banana rust thrips, *Chaetanophothrips orchidii*; syn. *C. signipennis*, stains the peel, causes it to split and expose the flesh which quickly discolors. The pest is usually partially controlled by the spraying of Dieldrin around the base of the pseudostem to combat the banana weevil borer, because it pupates in the soil. (Morton, j, 2004)

1.3.2 Diseases

Meladies is one of the worst diseases and greatest concern to banana and plantain growers. leaf spot, named as Sigatoka is caused by the fungus *Mycosphaerella musicola* It is mostly found on shallow, poorly drained soil and in areas where there is heavy dew. The leaves start showing its first signs which are very hard to detect, pale spots that can be up to to 1/2 in, become dark and it becomes gray in the center. When the entire plant is affected, the leaves will appear as though burned, the bunches will be of poor quality and will not mature uniformly. The fruits will be acid, the plant roots small. To control this disease it is achieved by spraying with orchard mineral oil, usually every 3 weeks, a total of 12 applications or by fungicides applied to the soil, easier to do by aerial spraying which is more effective in terms of time.

Another malady that bananas face is the Black Sigatoka, or Black Leaf Streak, caused by *Mycosphaerella fifiensis* var. *difformis*. It is spread mostly by wind; kills the leaves and exposes the bunches to the sun.

Panama Disease or Banana Wilt, which arises from infection by the fungus, *Fusarium oxysporum* f. sp. *Cubense.* It originates in the soil, then passed to the roots, enters the corm only through fresh injuries, and finally passes into the pseudostem. Then, beginning with the oldest leaves, turns them yellow first at the base, secondly along the margins, and lastly in the center. The pseudostem turns brown inside. This plague has seriously affected banana production in Central America, Colombia and the Canary Islands.

Moko Disease, or Moko de Guineo, or Marchites bacteriana, is caused by the bacterium, *Pseudomonas solanacearum*, it decays the plant in the inside. It has become one of the main diseases of banana and plantain in the western hemisphere and has seriously reduced production in the leading areas of Colombia. Iit attacks *Heliconia* species as well. It is transmitted by insects, machetes and other tools, plant residues, soil, and root contact with the roots of sick plants. There are said to be 4 different types transmitted by different means. Efforts at control include covering the male bud with plastic to prevent insects from biting the plant. Also disinfecting cutting tools with formaldehyde in water and the disposal of infected fruits and plant parts

Chapter 2: Biology

2.1 Chromosome Complement

Botanic expert Kasetsart, states Musa acuminata has 2n=2x=22 chromosomes. Cultivated species are mostly triploid (2n=3x=33) producing fruit without the seeds. Producing fruit without fertilization (parthenocarpy) which are very uncommon are seedless or with non germinable seeds, and diploids AA or triploid with the AAA genome constitution. Cooking bananas have AAB or ABB genome constitutions. (Kasetsart, J. (2009)

2.2 Life cycle and Phenology

3.2.1 Life cycle

Wild bananas usually bear fruit several times a year

The banana is a perennial herb that reaches the tree height and bears fruit within a year.

2.2.2 Phenology

Musa acuminata flowering and fruiting occurs at different times of the year. Plants usually die after inflorescence. Flowering phenomena prevents pollen transfer. The period of development from flower to fruit takes approximately four months.

2.2.2.1 Deciduosness

Wild banana has a high effectivity in case of growing since it rapidly occupies on any soil, being either good or bad soil in its necessary weather conditions it can grow on any soil. *Musa acuminata* seedlings are susceptible to fire

3.2.2.2.2 Flowering and fruiting

The process of fruiting is approximately four months for flowers to develop into fruits. It makes it difficult to self-pollinate because the flower structure.

2.2.3 Year-to-year variation in flowering and fruiting

Musa acuminata is constant in terms of flowering and fruiting accounting the conditions are normal and stable, with this i refer to climate conditions.

2.3 Reproductive Biology

2.3.1 Sexuality

Musa acuminata is propagated sexually by seeds. They are also propagated asexually by suckers that interact with the plant. *Musa acuminata* is a colonizer specie, which means it is the first specie to settle a designed area. It rapidly grows in new areas, and mostly areas that are recently affected by fires. This specie is very important for wildlife diversity and they can improve many ecosystems. It is very important as a food source for wildlife and has very rapid regeneration.

2.3.2 Anthesis

The anthesis (the flowering period of a plant, from the opening of the flower bud) of *Musa acuminata* is approximately 28 days

2.3.3 Pollination and potential pollinators

The pollinators are very important for the wild banana because the bananas

fluorescence structure prevents pollen transfer because the inflorescence and pollinators help its regeneration.

2.3.4 Fruit development and seed set

Based on a study made by agricultures, every two weeks flowering and fruiting were observed. In terms of the seedlings:

> *"The survival rate for seedlings that emerged directly from seeds (n = 170) and clones (n= 66) through the year was highly significantly different, with the former having a lower annual survival rate than the latter"(*Australian Government, 2008)

Seeds germinate normally after 2 to 3 weeks after it is planted. If the grain is unsprouted they can remain viable up to two years of storage. Studies have shown that when cloned the plants are most likely to survive than when germinated from seeds.

- Each fruit can have 15 to 62 seeds.

"Each seed of *Musa acuminata* produces around four times its size in edible starchy pulp. The new seedlings that emerged from seeds and clones were tagged producing a sample number of 170 and 66 seedlings, respectively"("Musa, Banana, Plantain," 2013)

2.4 Ecophysiology

*"The wild bananas produced a large amount of fruit containing many seeds This may have been an adaptation to seed competitors and the seed dispersal agents"(*Kasetsart, 2009)

Wild bananas usually produce large amount of flowers and seeds, which are easily dispersed.

Ripe Fruit of wild bananas is very attractive to frugivores and fruits or seeds can be dispersed away from the parent clumps.

Chapter 3: Propagation and management

3.1 Natural regeneration

Banana natural regeneration is very slow. This is because through suckers the hormone of the dominance of the mother plant brings a very slow process. A single banana plant produces between 5 to 20 suckers. A plant's lifetime is between 12-14 months, this means it produces around 13 suckers in a span of 13 months.

3.2 Nursery Propagation

3.2.1 Propagation from seed

3.2.1.1 Pre-preparation and implications for germinations

The seed propagation is common in wild species, which have normal meiosis, fertilization and seed set. Bananas are propagated vegetative rather than sexually because nearly all cultivated varieties are seedless. Bananas can develop without the need of seeds. The principal method of banana propagation is by suckers. Different size suckers for optimal planting material is used in different regions.

> "*Large suckers are the preferred planting material. These are removed from vigorous clumps of banana trees with a spade when at least three feet tall, during warm months. Pups should*

not be taken until a clump has at least three to four large banana plants to anchor it. When the pup is taken the cut must be into the mother banana plant enough to obtain some roots. Plant close to the surface. Large leaves are cut off of the pup leaving only the youngest leaves or no leaves at all." (Amiot, 2008)

3.2.1.2 Sowing and the germination process

Depending on the species, the number of seed set and germinability may change. In other genus of *Musa ssp*, seed propagation is the only way of propagation, since there is no production of suckers. The seeds are generally brown to black in color, 2-6 cm in diameter, round or triangular in shape. Fruits of wild species cannot be eaten, since they are full of seeds that are enveloped in pulp

"*In India, this propagation system is not followed because all cultivated commercial bananas are parthenocarpic*."(ICAR 2010)

parthenocarpic: is the natural or artificially induced production of fruit without fertilization of ovules.

3.2.1.3 Storage

In terms of the plant storage, plant should be healthy, free from type and free from diseases and pests, especially viruses. In addition in order to keep the plant in good conditions:

"The male flowers buds should be retained to check the presence of virus diseases (male flower buds exhibit symptoms of late infection of viruses like BBTV and BBrMV). Mother plants should be raised under roofless insect proof shade net with sufficient height. Mother nursery must be located away from other banana plantations with an isolation distance of 500 m to maintain purity and to avoid spread of virus diseases." (ICAR 2010)

3.2.2 Vegetative propagation

3.2.2.1 Grafting

To accelerate the propagation rate, suckers with growing buds are used. Another technique used is to use rhizomes cutted in pieces called 'bits' and peepers'

3.2.2.2 Cuttings

In terms of the banana plant, the cuttings should be good bits and there should be several of them- They can be cut from an unbunched rhizome after trimming the roots. It is important to pick an appropriate mother plant for the rhizomes. Should be cut uniformly sized rhizomes or bits, well trimmed around the growing sprout. Some farmers prefer to sun dry rhizomes during 2 to 3 days.

3.3 Planting

For planting there are two ways to propagate banana plant:

3.3.1 Macro propagation

The advantages with this method are that it can rapidly multiply the number of plants, it can distribute a new variety of plants, or it can replace plants in disease-affected fields. Additionally, It gives healthy plants if source suckers are from healthy mother plants and contamination is minimized during the process. Most importantly for macro propagated is that it can be done locally and it is a lower cost method where not much training is needed where a single farmer can do this activity.

3.3.2 Micro propagation

"Micropropogation is the practice of rapidly multiplying stock plant material to produce a large number of progeny plants under aseptic conditions, using modern plant tissue culture methods."(Dictionary.com)

"Steps involved in the micro propagation of banana :

- *Selection of pedigree mother plant.*
- *Establishment and maintenance of mother block nursery.*
- *Selection of superior planting material for in vitro initiation.*
- *Rouging at various stages of proliferation.*
- *Rooting, primary hardening and rouging.*
- *Secondary hardening and rouging off-types .*

  *Virus indexing and genetic fidelity testing at various stages of micro propagation."(*Australian Government 2008)

3.4 Management

3.4.1 Fruiting

The process of fruiting is approximately four months for flowers to develop into fruits. It makes it difficult to self pollinate because the flower structure. Based on a study made by agricultures, every two weeks flowering and fruiting were observed. In terms of the seedlings:

> *"The survival rate for seedlings that emerged directly from seeds (n = 170) and clones (n= 66) through the year was highly significantly different, with the former having a lower annual survival rate than the latter"(*Australian Government, 2008)

Seeds germinate normally after 2 to 3 weeks after it is planted. If the grain is unsprouted they can remain viable up to two years of storage. Studies have shown that when cloned the plants are most likely to survive than when germinated from seeds.

- Each fruit can have 15 to 62 seeds.

> *"Each seed of Musa acuminata produces around four times its size in edible starchy pulp. The new seedlings that emerged from seeds and clones were tagged producing a sample number of 170 and 66 seedlings, respectively*"("Musa, Banana, Plantain," 2013)

3.4.2 Pest and diseases control

<u>Erwinia head rot or Tip over disease:</u>

The disease is widespread in banana growing areas of the world. The casual agent is *Erwinia carotovora*. The symptoms are when The leaves of affected plant dry out suddenly. If the affected plant is pulled out, the corms with their roots will not go out easily with the plant among it. In the other hand, when the plant is affected with nematodes, it can be pulled out along with corm and roots. This is a distinguishable feature for soft rot disease. In early stage of infection dark brown or yellow, water soaked areas are visible in the cortex area. A solution to this disease is to drench tissue of the plant kept in polybags with 0.1% emission or 2% bleaching powder.

Parasitic nematodes infestation

Banana tissue culture plants are highly susceptible to parasitic nematodes. Nematodes enter the plant roots through contaminated water. The affected tissue of the plant become weak and cannot absorb nutrients as the roots are damaged. **“**In case burrowing or lesion nematode infection, the roots exhibit extensive reddish brown lesions in the cortex can be seen when cut longitudinally. Use water, soil and other pot mixture material free of parasitic nematodes. Fumigated pot mixture can be used for secondary hardening. Application of 2-3gm of carbofuran per plant in the secondary hardening stage can protect against invading nematodes.” (Khalil 2002)

Chapter 4: Emerging products, potential markets

4. Emerging products, potential markets

4.1 The overall picture

According to Edward Evans and Fredy Ballen, bananas are one of the World´s most important crops and it is produced in more than 130 countries. They are ranked fourth among the World's food crops in monetary value. “Americans consume more bananas than apples and oranges combined.”(Ballen, 2015) The banana economy is very important globally because it first gives money to exporting countries and it gives employment to thousands and hundreds of people in Latin America, Caribbean, Southeast Asia and Africa. Banana industry created huge distribution networks and supermarkets worldwide.

Ballen says The World production of bananas reached an estimated 97.3 million metric tonnes in the year 2009, which were grown on 4.9 million hectares. Bananas showed an increase in production of 49 percent between 2000 and 2009. The top five banana-producing countries are: India, the Philippines, China, Ecuador, and Brazil made all together 61 percent of global banana production in the year 2009, which in addition went up from 56 percent in 2000 just for these five countries. There were as well increases of this crop production in India and the Philippines.

based on the statistics on the FAO agricultural statistics, India is still the largest world producer of bananas. Based on 2009 the statistics India produced more than 26 million metric tonnes which is almost 30 percent of the global production. Philippines is the next world producer, making almost 10 percent of worlds market. China(9.2%) Ecuador(7.8%) Brazil(7%). Of these list, only Ecuador and the Philippines are major exporting countries.

Global export of bananas in 2009 was estimated to be 14.8 million metric tonnes, the equivalent of 15.3 percent of the world production that year, and was valued at approximately US$8.08 billion.

"The five leading banana-exporting countries in 2009 were Ecuador, Colombia, the Philippines, Costa Rica, and Guatemala. Together, they did approximately 84 percent of the global banana exports in 2009. Ecuador is the main supplier of bananas to the world market, with exports of 5.7 million metric meters, which is equivalent to 38 percent of the total volume of bananas traded in the year 2009. Next is Colombia, with a percentage of 13.2, then followed by the Philippines (11.7%), Costa Rica (11.5%) Guatemala (9.9%)." (Univeristy of Florida extension, 2009)

Based on statistics, bananas are the second most tradable fresh fruit. Latin America is by region the top supplier of bananas, by 83 percent among the rest. Then comes the Far east with 12.8 percent. The Caribbean which actually holds 0.4 percent of the world market has decreased due to the loss of preferential treatment from the EU market says the global indexbox marketing. Banana imports have been increasing very much this last decade. United states and Japan imported about 56 percent of fresh banana production.

The fresh banana market is controlled by only a few multinational companies which control the purchase, transport and marketing of its own. They have almost all the control of the quality of the fruit and its distribution since they own their own contract plantations, sea transport as well as distribution networks and ripening facilities. To name a few, Dole Food Company, Chiquita Brands International and Del Monte Fresh

Produce(Univeristy of Florida extension, 2009).

4.2 Flavour in musa accuminata

The flavor in a banana depends on its color and ripeness. When a banana is yellow with a little green on the end it is on the first stage of ripeness. The banana is not as sweet and it is just starting its sweetening process. A full yellow banana is at its ripe stage and its peel is thinner. The banana will be softer and sweeter. Consequently, a yellow banana with brown spots is a full-ripe banana. This is when it is at its maximum sweetness and strongest flavor. Lastly, a brown banana is over-ripe. it is super sweet and very soft, not so good to eat, but it is perfect for baking and making banana bread/ muffins.

On the other hand, banana flavouring is something science hasn't been able to perfection. They say it is almost impossible to replace banana taste and there is many versions to this, an expert in this topic wrote an article in BBC newspaper and it is as it follows: "Banana flavouring. You know it well. If you close your eyes for a moment and think back to those countless pieces of confectionery or flavoured puddings, that recognisably artificial banana-like note will probably come back to you. Monotone, saccharine, and quite removed from the real, fresh bananas you eat as a snack or with lunch.

Artificial flavours like these are often criticised as unnatural. However, some artificial flavourings are significantly closer to 'natural' than it might appear. The reason they sometimes fail to taste like their fresh counterparts can be more complex than simple chemistry– which is why flavour wizards and foodmakers are employing clever new techniques to trick our senses."(Baraniuk, 2014)

the bananas we know nowadays are similar to the banana known as Gros Michael, a type of banana that became extinct long ago, which was from which the artificial flavour was taken from. it has a more sweet flavour and it has a stronger taste than a normal banana.

4.3 Fresh fruit

Banana can be processed to make Banana Flour, Banana Pastilyas, Banana Puree, Dried Banana Blossoms, Banana Chips, Pastilyas De Saging, Banana Wine, Banana Vinegar, Banana Figs, Banana Sauce, Sauce from Banana Peeling, Paste from Banana Peeling, Vinegar from Banana Peeling, and Banana Catsup.(Pinoy Bisnes, 2016)

4.4 Woodcarvings and curios

The process converts the waste trunk of the banana palm into alternatives to forest wood products to be used in the paper, packaging, furniture, building, construction and other industries.

Chapter 5: Medicinal and traditional non-wood uses

5.1 medicinal uses

Bananas help lower blood pressure and reduce the risks of cancer and asthma. Bananas are rich in a mineral called potassium. What potassium does is that it helps maintain fluid levels in the body. It helps regulate nutrients and waste products found in cells. Also helps muscles to contract and nerve cells to respond. It also helps blood pressure to stabilize. One medium-sized

banana contains 422 milligrams of potassium. According to the National Health and Nutrition Examination Survey, fewer than 2% of US adults meet the daily 4700 mg recommendation. There are other medicinal uses found in banana as they follow:

5.1.1 Asthma

A study conducted by the Imperial College of London found that children who ate just one banana per day had a 34% less chance of developing asthma.

Cancer: Consuming bananas, oranges, and orange juice in the first two years of life may reduce the risk of developing childhood leukemia. As a good source of vitamin C, bananas can help combat the formation of free radicals known to cause cancer. High fiber intakes from fruits and vegetables like bananas are associated with a lowered risk of colorectal cancer.

5.1.2 Heart health: The fiber, potassium, vitamin C and B6 content in bananas all support heart health. An increase in potassium intake along with a decrease in sodium intake is the most important dietary change that a person can make to reduce their risk of cardiovascular disease, In one study, those who consumed 4069 mg of potassium per day had a 49% lower risk of death from ischemic heart disease compared with those who consumed less potassium (about 1000 mg per day).

5.1.3 Diabetes: Studies have shown that type 1 diabetics who consume high-fiber diets have lower blood glucose levels and type 2 diabetics may have improved blood sugar, lipids and insulin levels. One medium banana provides about 3 grams of fiber.

5.1.4 Digestive health: Bland foods such as apple sauce and bananas are recommended for diarrhea treatment. this stands for bananas, rice, applesauce, and toast.

Electrolytes like potassium are lost in large quantities during bouts of diarrhea and may make those affected feel weak. Bananas can replace these lost nutrients. Bananas can also help to promote regularity and replenish potassium stores.

5.1.5 Preserving memory and boosting mood: Bananas also contain tryptophan, an amino acid that studies suggest plays a role in preserving memory and boosting your mood.

The recommended intake of potassium for adults is 4,700 milligrams per day. Bananas provide a variety of vitamins and minerals:

- Vitamin B6 - .5 mg
- Manganese - .3 mg
- Vitamin C - 9 mg
- Potassium - 450 mg
- Dietary Fiber - 3g
- Protein - 1 g
- Magnesium - 34 mg
- Folate - 25.0 mcg
- Riboflavin - .1 mg
- Niacin - .8 mg
- Vitamin A - 81 IU
- Iron - .3 mg

(Stephealthylife, 2015)

5.2 Magic/ritual significance

According to sources from indian mirror culture, Banana is known

for its eternal evergreen, which signifies an eternal generation. The banana trees are very common in weddings for this same reason.

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