

Berry Exotic: Alternative Therapies

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Abstract

Exotic berries are beginning to be investigated for their preventative properties such as antioxidants, anti-inflammatory, and hypocholesterolaemic levels. Berries consisting of these factors have been shown to reduce the risk for cardiovascular complications, acute or chronic diseases and other metabolic disease processes. These natural remedies are used to create a more holistic approach to medicine. The question raised is if the natural antioxidants and anti-inflammatory properties that açaí, maqui, and blackthorn berries produce are more effective, less effective, or have no effect compared to medications that can be used. Research shows that reduction of glucose, total cholesterol and low density lipoprotein (LDL) from these berries have a positive effect on cardiovascular health, reduction of disease and reduction of risk for diabetes in overweight persons. After initial studies, the benefits prove to be worth using the açaí berry in moderation in addition to a healthy lifestyle. This paper will investigate the properties that make up exotic berries, such as the açaí berry, and their effects on specific body systems to determine the benefits of supplementation compared to other antioxidant rich berries and multivitamins.

Keywords: Berries, açaí, alternative therapies, natural, medical, antioxidants

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This idea for this paper originated in August 2015 at Indiana State University for a presentation on alternative therapies for nursing.

Introduction

Natural remedies are becoming increasingly popular in today's society. New research is constantly being done to find new ways to use these natural remedies for a more holistic approach to medicine. The use of exotic and natural berries and fruits is of current interest in society. These berries are trending in popular drinks at coffee shops and restaurants and now grocery stores, guiding toward the idea of a healthy lifestyle and that these berries will provide that lifestyle.

The açaí berry is particularly popular at the moment. Along with the açaí berry, research shows the maqui and blackthorn berries have the components and effects of the berries on the human body. These berries are said to contain high antioxidant levels as well as anti-inflammatory properties and hypocholesterolaemic activity. Basu, Rhone and Lyons (2010) state, the "consumption of fruits and vegetables has been correlated with decreased risks of cardiovascular disease (CVD)". The effects of these properties on the human body may include changes to metabolic processes and cardiac health.

The leading hypothesis that the tree that grows the açaí berry can "overcome the damaging effect of oxidative stress from lack of oxygen during seasonal flooding and exposure to UV radiation near the equator" (Hilderbrandt, 2012) began research on the açaí berry to determine if the berry had the same characteristics from which it was grown. Many Brazilian athletes, such as jiu-jitsu fighters, surfers, and runners, that consumed the açaí berry in many different ways found the effects to be beneficial. Açaí is popular in South America and is used for its effective health benefits for athletes. However, for those in poorer regions of the Amazon, açaí is a daily food, though they do not necessarily consume the berry for its healthy properties. Açaí has recently been climbing in popularity in the United States due to the reputation it has on

the health effects to the body. People's familiarity with the açaí berry is apparent now. One way to tell this is by the pronunciation of the word açaí: most people did not know how to pronounce this word until it became more popular.

Unknown

The specific effects of fruits such as berries are still partially unknown. Research has been done to determine the properties within the berries to conclude the effects on the health. Rather than researching an overall effect, results have demonstrated a narrower field of study in regards to the properties of a berry. These properties have been found to have effects on certain aspects of health such as cardiovascular and metabolic health. Exotic berries native to other regions are becoming more popular within the United States. There has not been a great amount of research completed on these berries. Therefore, the unknown fact remains of what properties these berries consist of and whether or not the exotic berries correlate with the traditional and native berries that are found on the market. Not only is the research on these berries determining the properties within the berries, but the effects of those properties on health. The true effects on cardiovascular and metabolic systems are currently unknown to most of the population, however, the correlation between an exotic berry and health is positive in the consumer's mind. The importance for the population to know the facts about the alternative therapies they use is vital to promoting healthy lifestyle and diet changes within the society.

Thesis and Research Questions

The question raised is if the natural antioxidants and anti-inflammatory properties that the açaí, maqui, and blackthorn berries produce are more effective, less effective, or have no effect compared to medications that can be used. Although the health benefits of the addition of berries to the diet are known, the specific effects of exotic berries are unknown. Therefore, I propose to

investigate the properties that make up exotic berries, such as the açaí berry, and their effects on specific body systems to determine the benefits of supplementation of these berries to one's diet. This will be achieved through determining the effects of the açaí berry on health, the advantages and disadvantages of adding the açaí berry to the United States market, the similarities and differences of the açaí berry and traditional berries, the comparison of the supplementation of exotic berries to other therapies, and the role of skepticism and criticism regarding this alternative therapy.

Summary

The information regarding this topic will be researched and gathered to formulate findings and conclusions. Research on the açaí berry began due to curiosity of the effects on healing, preventative healing, cardiovascular and metabolic health. The properties that derive from berries contain high antioxidant levels, anti-inflammatory properties and hypocholesterolaemic activity. The question remains of whether these properties such as the antioxidant levels and anti-inflammatory properties prove to be effective in the prevention, treatment, or management of health problems in the cardiovascular or metabolic systems.

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The word “natural” now encompasses a positive connotation toward healthy living. Although, the argument can be made that not all “natural” substances are beneficial to a person’s health. For this reason, it is important to conduct research on these new-found remedies and therapies that are taking over the marketplace. This society has placed a large importance on healthy living although that does not mean that every person is compliant with this mindset. Regardless, these natural remedies and alternative therapies are hitting the market, and consumers should be aware of the product that they are buying and the effects of the product.

Alternative therapies with fruits and vegetables are of particular interest in a healthy lifestyle due to the properties and natural effects they add to the body system. Berries have become an interest in research with the high antioxidant levels that can be consumed through them. Antioxidants have received praise for adding to a healthy lifestyle and working within the body. There are other properties that make up antioxidants that cause certain effects in the body which relate to specific body systems. Berries specifically work with the cardiovascular and metabolic systems. The antioxidants work with lipid and glucose levels and inflammation. New research is being conducted on exotic berries that are from other regions, such as the açaí berry from the Amazon. This berry has proven to have similar qualities to traditional berries, however, it has higher levels of antioxidants.

Effects of Açaí Berries on Health

Antioxidants inhibit oxidation promoted by oxygen or free radicals. The body uses antioxidants as a primary defense mechanism against free radicals to prevent damage to the cells. Antioxidants are often used as a preventative measure to ensure a preemptive response toward chronic and acute diseases that could be caused by free radicals. Açaí berries are particularly

known for their flavonoid antioxidant properties. Flavonoids are oxygen-containing antioxidant compounds that also provide anti-inflammatory effects as well as anti-allergen and anti-viral benefits. These types of antioxidants are particularly known for their benefits on heart health. Polyphenols can also act as antioxidants and effect cholesterol levels. Berries inhibit the action of oxidative stress and inflammation, therefore, reducing possible harm to the body and reducing the risk factors associated with these diseases such as cardiovascular disease and atherosclerosis. This is the reason that antioxidants, flavonoids, and other properties of these berries are important to health. Unfortunately, despite the beneficial effects of berries, they are one of the least consumed fruits in the United States.

The effects of the açaí berry on health and physical performance are of fairly new interest. Most commonly the berry is mixed with other fruits in a drink blend in the United States. Therefore, many studies use specific drink mixes to represent the açaí berry and its components. Studies have been conducted regarding the antioxidant, anti-inflammatory and hypocholesterolaemic properties of the açaí berry. However, there have not been many studies concerning the effects of these properties on the physical health and performance of the human body. Natives to the Amazonian region have only personally noticed the antioxidants and anti-inflammation effects on the body from the berries; although, this is not the reason for the introduction of the research on the topic. Therefore, in addition to researching the antioxidant, anti-inflammatory, and hypocholesterolaemic properties, these studies have related the properties of the berries to performance to determine the possible benefit of the berry. The questions asked were not necessarily due to initial observation, but rather, came about from curiosity of how to use natural and exotic fruits to benefit the body. This is because research is still being conducted on alternative therapies, as these therapies are not confined to one benefit.

Sadowska-Kepa, Klapcinska, Podgorski, Szade, and Hadzik (2015) used MonaVie Active mixture that includes the acaí berry as the main ingredient in addition to eighteen other fruits and berries for their study on the properties and effects of the acaí berry on sprint performance. The study included seven junior hurdlers that had recently won or become finalists in the National Junior Indoor Championships in Athletics. Although the consumption of the juice mix did not have a significant effect on the participants sprint performance, the study did find changes in levels of lipids and antioxidants. Lipid ratios were evaluated to determine the risk for vascular disease in the participants. The study did show that six weeks' supplementation of the mixture resulted in "enhanced blood antioxidant capacity and attenuated exercise-induced oxidative stress" (Sadowska-Krepa E et al., 2015) as well as improvement in the lipid profile of the participants. These properties have an overall effect on the risks for cardiovascular disease for the participants.

Udani, Singh, B., Singh, V., and Barrett (2011) also researched the effects of the acaí berry on cardiovascular health through the measurement of lipid and glucose metabolism in people who are overweight. Excess adipose tissue places a person at risk for cardiovascular disease and diabetes due to dysfunctions in the metabolism of lipids and glucose. Oxidative stress, which is due in part to free radicals, is thought to have an effect on the risk for cardiovascular disease. Obesity is linked to a higher level of oxidative stress and metabolic issues. Udani et al. (2011) measured the "levels of fasting plasma glucose, insulin, cholesterol and triglycerides" before and after the consumption of a Sambazon Acai Smoothie Pack twice daily for one month. Participants had to be ages 18-65 and have a BMI of greater than 25 kg/m² and less than 30 kg/m². This study included ten participants within three months. There were four visits in which a screening process, baseline assessment, follow-up, and compliance check

took place. Compared to the baseline, the açaí berry mixture resulted in the reduction of the fasting glucose, total cholesterol, and low density lipoprotein (LDL)-cholesterol levels.

Girones-Vilaplana, Valentao, Moreno, Ferreres, Garcia-Viguera, and Andrade (2012) took their study a step further to examine the açaí berry along with other specific berries as well as lemon juice to determine the antioxidant capacity and effects to apply to nutrition and health fields. Girones-Vilaplana et al. (2012) found that the maqui berry consisted of the highest antioxidant capacity and the açaí and blackthorn were also considerably higher than the lemon juice and controls. Each berry was found to have higher compositions of different properties than the other berries, giving the juice higher levels of radicals, enzymes and antioxidant capacities. The authors pointed out that this approach is a “100% natural food matrix with potential for daily consumption without any side effects” (Girones-Vilaplana et al., 2012). Although this study found that regarding antioxidant activity, the lemon-maqui juice was the most interesting blend, the lemon- açaí blend had the highest potential for inhibitory activity of cholinesterases (Girones-Vilaplana et al., 2012). This study showed that the açaí berry has high antioxidant levels.

The reduction of glucose, total cholesterol, and low-density lipoprotein (LDL) cholesterol supports the notion that the açaí berry has a positive effect on cardiovascular health and reduction of disease as well as the reduction of the risk for diabetes in overweight persons. Supplementation with the açaí juice was shown to support the claim that this berry contains properties that benefit the overall health of the participants, and lower the risk of potential chronic and acute diseases. This is attributed to the berry’s anti-inflammatory, antioxidant, and hypocholesterolaemic properties. The increased capacity permits the body to allow bonding of more antioxidants, therefore, decreasing the risk for chronic and acute diseases such as

cardiovascular diabetic diseases. I would highly recommend the use of the açaí berry in supplementation to a healthy diet to a patient.

Advantages and Disadvantages Compared to Traditional Berries

There are many advantages related to the addition of the açaí berry to the United States market. The açaí berry is native to the Amazonian region in Brazil. Only about ten percent of the açaí pulp is consumed by those outside of the Amazon, the other ninety percent is consumed by the lower Amazonian region. Initially, the target market for the beverage was the surfer population of the United States. Basu, Rhone, and Lyons (2010) found that it may be more beneficial to consume fresh or frozen berries rather than juices and extracts due to the decrease in nutrients during drying and pasteurization. Unfortunately, the açaí berry is not as easy to obtain and preserve in that form. The açaí berry is most commonly seen in mixed drinks rather than alone. As Rodrigo Correa, marketing manager of Acai Roots Inc., states: the “açaí [berry] is a very sensitive berry. Once it is harvested, its skin must be processed into a frozen pulp within about fifteen hours, otherwise it loses its nutritional values and antioxidant concentration” (Zegler, 2010). Storage of berries commonly has an effect on the antioxidant capacity of a berry. Not only does the nutritional store deplete during processing, but the antioxidant capacity also decreases. Due to the fact that the açaí berry is mainly found in mixed drinks, many studies have focused on these mixed drinks as the source of açaí to determine the effects of the berry and the amount of antioxidants within the drink. The cost of the açaí pulp can range from \$17-40 for a fourteen kilo basket (Crane, 2010). This pulp is in high demand and therefore, the consumer must be ready to purchase the pulp as soon as it reaches the market. Compared to the cost of treatment for heart disease, including hospitalization, medications, diagnostic tests, and potential surgeries, the cost of a preventative supplement and healthy lifestyle is significantly cheaper.

Açaí is one tenth the cost of other berries and seeds, which adds to the appeal. The cost is also less than what one would pay for medications to treat cardiovascular diseases, which is appealing to many people.

There are not many disadvantages of adding the açaí berry to the diet as a supplement that are known at this moment. Many of the studies done on the açaí berry have only concentrated on a small population; therefore, to promote further study of the topic, a larger population should be used. The inclusion of more participants will increase the data support and provide more opportunities to identify the effects of the açaí berry. A longer trial of the açaí berry juice mixtures would be helpful in determining longer term effects. This would also illustrate if the berries take longer to produce a significant effect on the participant's health status. Investigation of the effects of the açaí berry on specific disease processes would help determine the benefit of the açaí berry compared to pharmacological therapies. The supplementation of the açaí berry, as well as other fruits with antioxidant properties, provide potential benefits but do not have significant adverse effects that are known. Therefore, there are not currently any controversies against this alternative method.

Skepticism for Alternative Therapy

Previously there was skepticism in alternative diets and therapies. However, as Hildebrandt (2012) states, "some of the exotic berries, may become more accepted and mainstream". Research on fruits and healthy living has become popular within the last couple of decades. People are eager to find healthier, yet easy, ways to live. Berries became of particular interest due to the bioactive compounds and other properties that they contain. The search for these berries has become global as research is being conducted on exotic and non-native berries now as well. Berries are listed in the important food groups, in addition to traditional fruits such

as apples, citrus fruits and bananas. Skrovankova, Sumczynski, Mlcek, Jurikova, and Sochor (2015) state that in “the last few decades there has been a constant increase of popularity and an interest regarding research of all kinds of fruits. Particularly fruit berries are well studied, as they contain the best dietary sources of bioactive compounds”. Consumers tend to stick with familiar foods, such as traditional berries. However, recently consumers are shifting toward experimenting with the exotic berries and those berries are becoming a well-known item.

Similarities and Differences from Traditional Berries

Traditional berries have many similarities and few differences with exotic berries, especially the properties within them. Berries, in a variety of forms—fresh, juice, and freeze dried—improve “low density lipoproteins (LDL) oxidation, lipid peroxidation, total plasma antioxidant capacity, dyslipidemia, and glucose metabolism” (Basu, Rhone, Lyons, 2010). This is why berries are used for preventative purposes for risk factors associated with metabolic and cardiovascular disease. Berries contain free radicals which are seen in antioxidants, however, the açaí berry has been found to consist of the highest antioxidant levels. These antioxidants help reduce inflammation symptoms of degenerative diseases by decreasing overproduction of inflammation. Another benefit of berries is that they are low in calories, yet high in fiber. Blueberries were known as the original superfruit due to antioxidant properties such as anthocyanins and phytonutrients. A large difference between these two superfruits is that blueberries can be found prepared in many varieties while açaí berries are only prepared one way.

Blueberries have been researched for properties that will reduce the risk for cardiovascular disease (CVD) for several years, finding the same properties that are in the açaí berry. However, these properties have been found in a smaller amount in the blueberries than in

the açaí berry. Although all berries carry the same properties in one way or another, there are different levels in which they contain those properties. For example, strawberries have less antioxidant capacity than blueberries; however, blueberries have less antioxidant capacity than açaí berries. While some studies did not note a significant change in the risk factors for CVD, they did show an association between consumption of berries and the effects on the inflammatory process within the body that overall reduces the risk for CVD. Berries in general have been proven to have an effect not only on the cardiovascular system but also on type one and two diabetes mellitus, as well as other metabolic disorders. These effects have been found to be specific to açaí berries as well. Many drinks are being formulated with multiple berries high in antioxidants. Blueberries are paired well with other fruits and berries high in antioxidants, such as the açaí berry. The açaí berry is mostly found only in mixed drinks. This is the focus of many of the studies on açaí berries themselves. However, açaí berries have been found to have ten to thirty percent the level of antioxidants than blueberries. Skrovankova et al. (2015) also state that traditional berries have an effect on reducing the risk for certain cancers. The properties contained in the traditional berries that correlate with this reduced risk are also properties of the exotic berries: bioactive compounds such as flavonoids and anthocyanins, and ascorbic acid. Although exotic berries were not included in this study, it is important to note the similarities in properties. This would be another research area to consider for the exotic berries.

Basu, Rhone, and Lyons' (2010) study also showed that trials in which men and women participated demonstrated different results in regard to opposite genders. Healthy men using cranberry juice supplementation showed a significant decrease in systolic blood pressure which is a risk factor for CVD. Although, traditional berries are known to have similar properties as exotic berries, they are not the only food that contributes to heart health. Berries are known for

the composition of polyphenols and antioxidants that lower low-density lipoproteins that form plaque inside the arteries. Harvard Health Medical School (2014) states that extra-virgin olive oil can have a similar effect to berries in lowering low-density lipoprotein cholesterol, and blood pressure. Avocados, oatmeal, and oranges also have an effect on the absorption and lowering of low-density lipoprotein cholesterol.

Supplementation of Multivitamins and Acai Berries

Many people take multivitamin supplements to aid their health in many different ways. Antioxidant multivitamin supplements are popular in the supplementation for cardiovascular health. People often turn to supplements due to fast-paced lives and the convenience of the vitamin. Unfortunately, people do not realize that a sufficient amount of nutrients may not be completely consumed or absorbed through supplementation of vitamins. Obtaining the nutrients from the original source is the best choice. Hsien-Tsai, Cyuan-Cin, Ding-Yuah, Jyun-Hao, Cheuk-Kwan, Jian-Jung (2013) conducted a study after giving young adults nutritional supplements to aid and compare cardiovascular health and carotenoid content variation. Carotenoids are not made by the human body; therefore, they are a necessary part of the diet. Gammone, Riccioni, and D’Orazio (2015) state that “circulating carotenoids will in particular be lower if they exist in a highly free radical environment”. Berries provide the free radical environment in which those authors refer. There are many types of carotenoids that are present in different fruits and vegetables and are responsible for different characteristics and actions produced by the food. Hsien-Tsai et al. (2013) found that in order to improve carotenoids concentration without significant changes to the cardiovascular system, lifestyle and diet habits must be improved. Large low-density lipoprotein receptors tend to collect high amounts of carotenoids. The antioxidant features of berries decrease the amount of low-density lipoprotein.

Therefore, supplementation of berries, such as the açaí berry that contains high levels of antioxidants, is beneficial to include with the addition of multivitamins to the diet to regulate the effects of each on the cardiovascular system.

Conclusion

Introduction

As natural remedies become more popular in today's society, research on the new therapies is highly important. The health benefits of the addition of berries to the diet are proven to be beneficial and promote a healthy lifestyle. However, some berries are composed of more properties than others that relate to cardiovascular and metabolic health systems. Exotic berries are beginning to be investigated for their preventative properties such as antioxidants, anti-inflammatory, and hypocholesterolaemic levels. Berries such as the açaí berry contain these properties and therefore lower the risk for cardiovascular disease and other metabolic disease processes. The açaí berry is being used as a supplementary food item to improve cardiovascular health in addition to other berries and multivitamins.

Summary of Findings

The açaí berry does not have a significant effect on athletic performance; however, it does have a great effect on lowering lipid levels through antioxidant features. Açaí properties have an overall effect on risk factors for cardiovascular disease. This berry is also linked to lowering plasma glucose levels that contribute to metabolic diseases such as type one and two diabetes. The açaí berry is beneficial to health and is recommended to use in moderation; however, it is not easy to obtain in multiple forms. This is one of the differences and challenges compared to traditional berries with similar properties that can be found in many forms. However, the cost for the exotic açaí berry is cheaper than the traditional forms. The use of

exotic berries, such as the açaí berry, is becoming a more popular alternative therapy. Açaí berries can supplement multivitamins that are used for the same effects, although one should speak with a medical professional prior to supplementation.

Continued research on the effects and benefits of the berry should be conducted. The açaí berry has not been shown to have adverse effects during supplementation. Rather the berry contains properties that aid in the prevention of chronic and acute diseases. After initial studies, the benefits prove to be worth using the açaí berry in moderation in addition to a healthy lifestyle. Taking into account the research that has been done currently on the effects of the açaí berry on cardiovascular and metabolic health, supplementation can occur in the diet with careful attention to medication interactions. The açaí berry in any form should not be used as the sole treatment of a disease; however, it can be used as a supplement to potentially decrease the dosage of medications treating the same disease or multivitamins used to prevent disease. Currently, açaí berry mixes and other berries are used in the preventative care. Berries should be included as an essential fruit group to supplement a healthy lifestyle and diet.

Closing

Alternative therapies are applicable to any medical profession and any person seeking medical aid. The nursing profession educates patients on alternative therapies to aid in lifestyle and diet changes to reduce the risk of disease and to promote healthy living. This is a part of holistic care that nursing is centered upon. The focus is on the patient and the lifestyles modifications that can be made before reverting to medications and other invasive treatments. Cardiovascular and metabolic health is a prominent area of disease in this society. Therefore, therapies to prevent disease and promote health are welcomed. Natural ways of producing this effect are better than supplementing with artificial supplements due to the nutritional depletion

upon storage and processing. Other medical disciplines can use this therapy to prepare an inexpensive plan of care for the patient that the patient can use every day. These therapies, such as the use of açaí for antioxidants can be used by people outside of a medical environment at the moment as well. The use of exotic berries as a natural remedy is becoming increasingly popular to aid in cardiovascular and metabolic health.

References

- Basu, A., Rhone, M., & Lyons, T. J. (2010). Berries: emerging impact on cardiovascular health. *Nutrition Reviews*, 68(3), 168-177. doi:10.1111/j.1753-4887.2010.00273.x
- Crane, Janet (2010). Acai: Superfood of the Amazon: This tropical berry has been a dietary staple for much of Brazil long before its health benefits were extolled world-wide. *Americas (English Edition)*, (5). 20.
- Gammone, M. A., Riccioni, G., & D'Orazio, N. (2015). Carotenoids: potential allies of cardiovascular health?. *Food & Nutrition Research*, 591-11.
- Girones-Vilaplana, A., Valentao, P., Moreno, D. A., Ferreres, F., Garcia-Viguera, C., & Andrade, P. B. (2012). New Beverages of Lemon Juice Enriched with the Exotic Berries Maqui, Acaí, and Blackthorn: Bioactive Components and in Vitro Biological Properties. *Journal Of Agricultural And Food Chemistry*, (26).
- Hildebrandt, S. (2012). A dose of berry wellness: the health benefits of berries resonate with consumers. *Beverage Industry*, (10). 56.
- Hsien-Tsai, W., Cyuan-Cin, L., Ding-Yuan, C., Jyun-Hao, D., Cheuk-Kwan, S., & Jian-Jung, C. (2013). Cardiovascular Benefits of Oral Antioxidant Multivitamin Supplements in Young Adults with Low Body Mass Index. *Current Topics In Nutraceutical Research*, 11(4), 159-165.
- Sadowska-Krępa, E., Kłapcińska, B., Podgórski, T., Szade, B., Tyl, K., & Hadzik, A. (2015). Effects of supplementation with acai (*Euterpe oleracea* Mart.) berry-based juice blend on the blood antioxidant defence capacity and lipid profile in junior hurdlers. A pilot study. *Biology Of Sport*, 32(2), 161-168.

Sizing up 'superfoods' for heart health. Many foods--from the everyday to the exotic--are rich in nutrients that may help keep your arteries clear and your heartbeat stable. (2014).

Harvard Heart Letter: From Harvard Medical School, 24(7), 1.

Skrovankova, S., Sumczynski, D., Mlcek, J., Jurikova, T., & Sochor, J. (2015). Bioactive Compounds and Antioxidant Activity in Different Types of Berries. *International Journal Of Molecular Sciences*, 16(10), 24673-24706. doi:10.3390/ijms161024673

Udani, J., Singh, B., Singh, V., & Barrett, M. (2011). Effects of Açai (*Euterpe oleracea* Mart.) berry preparation on metabolic parameters in a healthy overweight population: A pilot study. *Nutrition Journal*, (1), 1-7.

Willimann, M. (2015). *Berry Exotic Alternative Therapies*. Nursing Synthesis. Indiana State University, Terre Haute, Indiana.

Zegler, J. (2010). Antioxidants make acai a go-to superfruit: Amazon berry establishes itself with versatile formulations. *Beverage Industry*, (9). 66.