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HEALTH BENEFITS AND USES OF AVOCADO

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ABSTRACT

This study aimed to present a literature review about the characteristics, applications and potential of avocado (***Persea americana***). Avocado is considered one of the main tropical fruits, as it contains fat-soluble vitamins which are less common in other fruits, besides high levels of protein, potassium and unsaturated fatty acids. Avocado pulp contains variable oil content and is widely used in the pharmaceutical and cosmetics industry and in the production of commercial oils similar to olive oil. This fruit has been recognized for its health benefits, especially due to the compounds present in the lipidic fraction, such as omega fatty acids, phytosterols, tocopherols and squalene. Studies have shown the benefits of avocado associated to a balanced diet, especially in reducing cholesterol and preventing cardiovascular diseases. The processed avocado pulp is an alternative to utilize fruits, which can be used in various value-added food products. Fluid extract of the avocado leaves is widely used in pharmaceutical products, mainly due to the diuretic characteristic of the present compounds in plant leaves. With the increasing research supporting the nutritional characteristics and benefits of avocado, the tendency is to increase the production and exploitation of this raw material in India, as also observed in other countries.

KEYWORDS: Avocado tree; avocado oil; unsaturated fatty acid; bioactive compounds.

INTRODUCTION

The avocado tree belongs to the family lauraceae native to central Mexico, classified as Persea Americana (Chen et al., 2008). Also called alligator pears, avocado pears are exotic plants that are quick to grow and make attractive, evergreen houseplants with masses of dark green leaves. The fruits are a greenish, thick-skinned drupe that may be pear shaped, egg-shaped, or spherical, the flesh of which has the consistency of firm butter and a faint nutlike

flavour when ripe. It is a firm conviction that this decade should see mainstream connection between food and health. Thus food that either heal or prevent sickness should be the focus of eating. Epidemiological data reflect that Africans would have to triple their intake of fruits and vegetables to reach the amounts consumed in parts of the Mediterranean during the 1960's in order to observe a low incidence of chronic diseases.

NUTRITIONAL AND PHYSICOCHEMICAL CHARACTERISTICS OF AVOCADO

In india, the ripe fruit is more appreciated, together with sugar, honey and liqueurs and consumption is influenced mainly by its sensory and nutritional characteristics. The pulp content in several varieties is between 52.9 and 81.3%, relative to fruit mass *(Tango et al., 2004).* High lipids and low carbohydrate levels remain in avocado pulp after water removal, thus conferring a high dry matter content to the product. Therefore, it is considered one of the few cultured fruits presenting the lipid fraction as the major component *(Tremocoldi, 2011),* which can reach up to 25% of the fruit portion *(Hierro et al., 1992; Abreu et al., 2009).* The avocado pulp contains from 67 to 78% moisture, 13.5 to 24% lipids, 0.8 to 4.8% carbohydrate, 1.0 to 3.0% protein, 0.8 to 1.5% ash, 1.4 to 3.0% fiber and energy density between 140 and 228kcal *(Soares & ito, 2000).* Avocado has four (4) times more nutritional value than any other fruit except banana, containing proteins (1 to 3%) and significant levels of fat-soluble vitamins *(Francisco & Baptistella, 2005),* folic acid and appreciable amounts of calcium, potassium, magnesium, sodium, phosphorus, sulphur and silicon and vitamins E, B1, B2 and D *(Dembitsky et al., 2011).* The fruit stands out on potassium levels (339mg 100g-1) when compared to other fruits, which regulates muscle activity and protects the body from cardiovascular diseases *(Canciam et al., 2008).* It also represents a source of glutathione, a powerful antioxidant that acts on potentially carcinogenic compounds *(Wang et al., 2012).*

BIOACTIVE COMPOUNDS IN AVOCADOS

In addition to the important major compounds, avocado contains substantial amounts of bioactive compounds such as phytosterols, especially in the lipid fraction and the main representative is the β-sitosterol *(Salgado et al, 2008b; Santos et al, 2014).* Diets rich in phytosterols can lead to the reduction of the total cholesterol and LDL cholesterol *(Lottenberg, 2002).* A 17% decrease average in blood cholesterol levels was observed in a study in Mexico with 45 volunteers who consumed avocado once a day for one week *(Borges & melo, 2011).* Phytosterol is a substance of vegetable origin whose structure is very similar

to cholesterol. Its mechanism of action in the body involves the inhibition of intestinal cholesterol absorption and decreased hepatic cholesterol synthesis. it acts on total plasma cholesterol and LDL cholesterol without affecting HDL and blood triglycerides. The benefit of cholesterol reduction also comes from replacing saturated by unsaturated fats, which promote a decrease in total cholesterol and LDL and an increase in HDL levels *(Salgado et al., 2008).* The β-sitosterol in avocados also has a special effect on immunity, contributing to the treatment of diseases such as cancer, HIV and infections. In relation to cancer, it works by suppressing carcinogenesis and in HIV by strengthening the immune system *(Bouic, 2002).* This compound enhances lymphocytes proliferation and natural killer cell activity, which inactivates invading microorganisms *(Bouic et al., 1996).* In addition, studies have shown that the β-sitosterol activity is an aid in weight loss by reducing compulsive eating binge and fat accumulation in the abdominal region *(Senai, 2006; Murta, 2013).* The health effects of sterols and stanols have been the subject of several studies. Some authorshave demonstrated a 25% reduction in the risk of coronary heart disease with the consumption of 2g of such compounds per day, which are included in the formulations of margarines, spreads, and vegetable oils by esterification without affecting vitamins solubility *(Turatti, 2002).* The avocado oil variety Margarida contains a greater diversity of sterols and β-sitosterol represents 71.8% of the total sterols, besides lower cholesterol levels (0.3%), which can achieve up to 2.3% in other varieties *(Salgado et al., 2008). Santos et al. (2014)* investigated the oil from Fortuna avocado extracted with petroleum ether and subjected to drying under forced air (40°C) and found 87.6% β-sitosterol, 12.41% campesterol and 0.04% stigmasterol of the total phytosterols. Avocado also has a carotenoid named lutein that helps protect against prostate cancer and eye diseases such as cataracts and macular degeneration *(Johnson, 2005).*

AVOCADO OIL

The avocado pulp contains high lipids content, which makes the pulp the portion of greatest interest. Lipids vary from 5 to 35%, being formed mostly by unsaturated fatty acids (60-84%) *(Borges & Melo, 2011).* The avocado varieties with lower core and shell percentages are most interesting for oil extraction due to higher pulp yield, and the variety Quintal stands out *(Tango et al., 2004).* The high moisture content in fresh pulp is the main obstacle for obtaining avocado oil as it affects the extraction yield and production costs. Thus, the varieties most suitable for oil extraction, The traditional cold pressing method for vegetable oils was replaced by solvent extraction. Although some authors have reported a yield of 59%

in oil extraction from fleshy pulp when using hexane, this value decreased to 12% when acetone was used as solvent *(Abreu et al., 2009)*. *Santos et al.* (2013) evaluated the extraction yield of avocados oil as a function of the drying process (freeze-drying or air flow: 40 to 70°C) and extraction method (pressing and solvent) of a pulp containing 5 to 6.5% moisture. The authors reported oil contents between 25 and 33% by cold pressing and between 45 and 57% by solvent extraction, while the freeze-drying method showed higher oil yield than the oven drying under forced air. The enzyme-assisted aqueous extraction has emerged as an alternative and environmentally friendly extraction process *(Abreu et al., 2009).* The small avocado oil volume currently produced by some countries is used in its raw form by the pharmaceutical and cosmetics industries, once its unsaponifiable fraction is responsible for regenerative properties of the epidermis. Avocado oil is easily absorbed by the skin, with high absorption power of perfumes, which is of great value to the cosmetics industry. In addition, it easily forms an emulsion, ideal for the manufacture of fine soaps *(Tango et al., 2004).* In comparison to other vegetable oils, avocado oil is characterized by having high levels of monounsaturated fatty acids (oleic and palmitoleic acids), low polyunsaturated fatty acids (linoleic acid) and relatively high levels of saturated fatty acid (palmitic and stearic acids). This fatty acid composition is influenced by the cultivars, maturity stage, anatomical region of the fruit and geographic location for plant growth *(Tango et al., 2004). Rocha (2008)* has reported that avocado oil from the varieties Wagner, Fortuna, Hass and Fuerte had higher levels of monounsaturated fatty acid (MFA) ranging from 59 to 72% of total fatty acids, followed by saturated fatty acids (SFA), from 17 to 23% and polyunsaturated fatty acids (PUFA) to a lesser extent with levels ranging between 10 and 14%. *Santos et al. (2014)* determined the fatty acids profile of Fortuna avocado, evaluating the effect of the pulp drying process (freeze-drying or air circulation: 40 and 70°C) and oil extraction method (solvent or pressing). The authors reported that oleic fatty acid represented more than half of the total fatty acids of this raw material, together with substantial amounts of unsaturated linoleic and palmitoleic acids. They also verified that the dehydration of the pulp can affect the fatty acid profile since the oil extracted from the lyophilized pulp contained higher levels of unsaturated fatty acids. With respect to the extraction method, no significant effects were observed. Avocado oils from the varieties Northrop, Duke, Wagner, Quintal and Fuerte are characterized by having more than 63% oleic acid, while the oils from the varieties Rincon, Barker, Waldin, Prince and Panchoy showed less than 50% of this fatty acid. Palmitic acid content ranged between 15.38 and 32.37% in oils from different varieties. Therefore, the avocado variety affects the levels of palmitic acid and oleic acid, once varieties with high

oleic acid levels had low palmitic acid levels and vice versa *(Bleinroth & castro, 1992).* In addition to its fatty acid composition, these oils contain other bioactive minor components such as tocopherols, squalene, b-sitosterol, campesterol, and cycloartenol acetate, with positive effects on health *(Dembitsky et al., 2011; Santos et al., 2014b).* Besides the possibility of using pure avocado oil as a substitute for olive oil, the combination of olive oil and avocado oil to replace olive oil mixtures (mainly using soybean oil) usually offered by the internal market is a promising alternative to reduce costs of Brazilian olive oil imports *(Salgado et al., 2008).* Avocado oil for salad dressings should be submitted to winterization to eliminate the saturated triglycerides, which can cloud the oil stored at low temperatures (*Salgado et al., 2008b).* Although the lipid extraction process generates large accumulation of pulp residues in the processing industries, the high fiber content of this by-product allows its use for preparation of flour to be used in bakery products like cookies, breads and pasta thereby increasing the supply of fiber-rich products *(Chaves et al., 2013).*

APPLICATIONS AND FORMS OF PRESERVATION OF AVOCADO PULP

The processed products of avocado pulp include the paste, puree and guacamole. Guacamole is a fruit pulp seasoned with salt, onion, lemon, pepper and tomato, being produced not only in an artisanal way but also marketed by some US companies *(Daiuto et al., 2011).* The sensory quality of guacamole of Hass variety made without chemical additives and stored under refrigeration was evaluated according to the type of packaging used. A greater consumers' acceptance was observed for the product stored in container with gas barrier when compared to that stored in polyethylene package *(Daiuto et al., 2011).* Although these authors have also considered that the heat treatment may have been effective on the polyphenol oxidase inactivation, it can result in the development of bitterness and off-flavors in avocado, which changes the guacamole texture, negatively contributing to a mashed appearance. *Chaves et al. (2013)* studied avocado pulp Margarida variety dehydrated and defatted by cold pressing and avocado oil to partially replace wheat flour and butter, respectively, in whole grain crackers. The authors reported that the flour from avocado pulp, in general, showed characteristics similar to those of conventional flour and whole wheat flour. The biscuits had higher minerals and fiber levels, with good sensory acceptance.

Meat derivatives can also be supplemented with avocado pulp, since most of these processed foods contain relatively high levels of saturated fats in the formulation whose consumption is restricted by health issues. Thus, an alternative to reduce and enhance fatty acids balance is

the incorporation of fats or vegetable oils in emulsified meat products *(kayaardi & gök, 2004; lugo et al., 2006).* The replacement of animal fats by vegetable oils in meat products has been studied with positive effects on the chemical, physical and sensory characteristics of the products, but with negative effects on water activity and texture (*Lugo et al., 2006*). Products that contain high levels of vegetable oil, like avocado, are sensitive to oxidation, resulting in rancidity and hence production of undesirable flavours and loss of quality during storage. *elez-martinez et al. (2005)* demonstrated the possibility to control oxidative rancidity in processed avocado puree with the use of α-tocopherol and ascorbic acid. Several preservation methods have been studied to obtain a stable avocado pulp, including pasteurization, drying, oil extraction, freezing and freeze-*drying (Palou et al, 2000; Soliva et al., 2001; Fortuny et al, 2004).* Use of microwave heating and copper chloride to preserve colour of mashed avocado has been also investigated *(Guzmán et al., 2002).* Furthermore, chemical reducing agents, sequestrants, acids, nitrogen atmosphere and vacuum and high hydrostatic pressure treatment have been studied.

BY-PRODUCTS

Avocado seed is underutilized and represents a large portion of the fruit, thus its use can be an alternative to reduce the production cost of edible oil. However, the main problem in the use of avocado seeds is the presence of phenolic compounds that exhibit toxicity. Studies have shown that the seeds can be used in feed for monogastric animals after extraction of these substances with ethanol *(Ichimaru et al., 1982).* The extract may present antioxidant activity, once the phenolics levels in seeds vary from 2.3 to 5.7%. In addition to the starch and fiber, there are other non-nitrogenous substances present in seeds, ranging from 5.1 to 13.2% *(Salgado et al., 2008).* Avocado leaves are a pharmaceutical ingredient widely used in extracts for therapeutic purposes and also as teas in folk medicine *(vendruscolo & mentz, 2006),* probably due to the diuretic properties *(wright et al., 2007).*

Phytochemicals as orhamnetin, luteolin, rutin, quercetin, and apigenin have been isolated from avocado leaves, which can help prevent the progress of various diseases related to oxidative stress.

CONCLUSION

Avocado can be an excellent alternative for industry, especially for pulp processing or oil extraction, considering its composition and the benefits of its compounds. Furthermore, the great diversity of plant species should be taken into consideration, since it provides the spread

of cultivation and good availability of fruit, regardless of the time of year. This crop can be used for exportation and oil extraction, application in processed products, or as raw material in the pharmaceutical and cosmetic industries, generating high value added products. The pulp residue from oil extraction may also be used for manufacture of food products. Several studies have demonstrated the health benefits of a balanced diet with avocado intake, especially in lowering cholesterol and preventing cardiovascular diseases. With increasing research on the nutritional characteristics and avocado benefits, it is expected an increase in production and exploitation of this raw material in India, as observed in other countries.

REFERENCES

1. ABREU, R.F.A.; PINTO, G.A. Extração de óleo da polpa de abacate assistida por enzimas em meio aquoso. In: SIMPÓSIO NACIONAL DE BIOPROCESSOS, 17., 2009, Natal, RN. Anais... Natal: Universidade Federal do Rio Grande do Norte, 2009. 6p. Available from: <http://ainfo.cnptia.embrapa.br/digital/bitstream/ CNPAT-2010/11482/1/AT09041.pdf>. Accessed: Jul. 11, 2013.
2. ALMEIDA, G.V.B.; SAMPAIO, A.C. O Abacate no mundo, no Brasil e na CEAGESP. Sociedade Brasileira de Fruticultura, 2013. Available from: <http://www.todafruta.com.br/noticia/28119/O+A BACATE+NO+MUNDO,NO+BRASIL+E+NA+CEAGESP>. Accessed: Jul. 23, 2014.
3. BLEINROTH, E.W.; CASTRO, J.V. Matéria prima. In: ITAL. Abacate cultura, matéria-prima, processamento e aspectos econômicos. 2.ed. Série Frutas Tropicais. Campinas: ITAL, 1992. Cap.2, p.58-147.
4. BORGES, M.H.C.; MELO, B. A cultura do abacateiro. Available from: <http://www.fruticultura.iciag.ufu.br/abacate.html>. Accessed: Jun. 01, 2011.
5. BOUIC, P.J.D. Sterols and sterolins: new drugs for the immune system? Drug Discovery Today, v.7, n.14, p.775-778, 2002. Available from: <http://www.sciencedirect.com/science/article/ pii/S1359644602023437>. Accessed: Dec. 22, 2015. doi: 10.1016/ S1359-6446(02)02343-7.
6. BOUIC, P.J.D. et al. Beta-sitosterol and beta-sitosterol glucoside stimulate human peripheral blood lymphocyte proliferation: Implications for their use as an immune modulatory vitamin combination. International Journal of Immunopharmacology, v.18, n.12, p.693-700, 1996. Available from: <http://www. sciencedirect.com/science/article/pii/S0192056197855518>. Accessed: Dec. 22, 2015. doi: 10.1016/S0192-0561(97)85551-8.

7. BRUFAU, G. et al. Phytosterols: physiologic and metabolic aspects related to cholesterol-lowering properties. Nutrition Research, v.28, p.217-225, 2008. Available from: <http://www.sciencedirect. com/science/article/pii/S0271531708000316>. Accessed: Dec. 22, 2015. doi: 10.1016/j.nutres.2008.02.003.
8. CANCIAM, C.A. et al. Elaboração e análise de iogurte sabor abacate, Ponta Grossa, PR, 2008. In: SEMANA DE TECNOLOGIA EM ALIMENTOS, 6., 2008, Ponta Grossa, PR. Anais... Ponta Grossa: Universidade Tecnológica Federal do Paraná, 2008. v.2, n.10, 3p.
9. CHAVES, M.A. et al. Preparation of whole cookie using avocado pulp flour and oil. Boletim do Centro de Pesquisa e Processamento de Alimentos, v.31, p.215-226, 2013. Available from: <http://dx.doi.org/10.5380/cep.v31i2.34844>. Accessed: Dec. 22, 2015. doi: 10.5380/cep.v31i2.34844.
10. DAIUTO, E.R. et al. Sensory analysis of cold-stored guacamole added with α-tocopherol and ascorbic acid. Revista Ceres, v.58, n.2, p.140-148, 2011. Available from: <http://www.ceres.ufv.br/ ojs/index.php/ceres/article/view/3579/1471>. Accessed: Dec. 22, 2015. doi: 10.1590/S0034-737X2011000200002.
11. DARVAS, J.M. et al. Effect of treatment after picking on the incidence of post-harvest fruit diseases of avocado. Phytophylactica, v.22, n.1, p.93-96, 1990. Available from: <http://www.cabdirect.org/abstracts/19902301449.html>. Accessed: Dec. 22, 2015.
12. DEMBITSKY, V.M. et al. The multiple nutrition properties of some exotic fruits: Biological activity and active metabolites. Food Research International, v.44, p.1671-1701, 2011. Available from: <http://www.sciencedirect.com/science/article/pii/S0963996911001608>. Accessed: Dec. 22, 2015. doi: 10.1016/j. foodres.2011.03.003.
13. ELEZ-MARTINEZ, P. et al. Natural antioxidants preserve the lipid oxidative stability of minimally processed avocado pure. Journal of Food Science, n.70, p.325-329, 2005. Available from: <http:// onlinelibrary.wiley.com/doi/10.1111/j.1365-2621.2005.tb09986.x/ abstract>. Accessed: Dec. 22, 2015. doi: 10.1111/j.13652621.2005.tb09986.x.
14. FAO (ORGANIZAÇÃO DAS UNIDAS PARA ALIMENTAÇÃO E AGRICULTURA). Available from: <http://www.fao.org>. Accessed: Jul. 16, 2013.