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### Antioxidant effects of chemical compounds in black tea

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**Abstract:** *Camellia sinensis* (L.) Kuntze is a small tree of the family Theaceae, of Asian origin, well adapted to cultivation in Brazil. The consumption of black tea, made from the infusion and complete fermentation of the leaves of this plant, is culturally carried out in the east and the west. This study aims to, through a review, relate the presence of certain chemical groups present in tea with the antioxidant therapeutic effects caused by its consumption. A high concentration of polyphenols (3 to 20%) was identified in black tea, among them catechins such as epicatechin (EC), galatocine gallate (ECG), epigallocatechin (EGC) and epigallocatechin gallate (EGCG). The polyphenols present in the fermented tea of *Camellia sinensis* are reported to be responsible for the antioxidant effects produced by tea. In vivo studies have identified the effective ability of polyphenols to inhibit lipid peroxidation and cause upregulation of the endogenous antioxidants SOD, GST, GHS, GR, CAT and GPx. Preventing the exaggerated formation of free radicals, thus contributing to the reduction of the risk of cancer and neurodegenerative diseases. Therefore, promoting in-depth studies on the therapeutic effects of black tea is a promising method for the development of treatments related to cancer and other diseases caused by oxidative stress..

**Keywords:** *Camelia sinensis*; black tea; antioxidant effects; polyphenols;

## 1. Introduction

The tea produced from the leaves of *Camellia sinensis* L. is consumed worldwide due to the observation of its medicinal properties. There are currently three types of presentation of this drink, green tea, black tea and Oolong tea. These will vary according to the process of preparation of the leaves for infusion, in the black tea is made the complete oxidation and fermentation of the leaves, whereas in green tea the leaves are not oxidized and in Oolong tea they undergo a semi process - oxidation. (Singh et al., 2017)

Among the three types of tea derived from the leaves of *Camellia sinensis* L., black tea is the most consumed world and the most consumed in the West. Due to the fermentation process by which the leaves of this tea pass, the polyphenols theaflavins and thearubigins are formed. (YANG et al., 2008).

## 2. Results and Discussion

The production of free radicals in an exaggerated way can cause damage to the structure of cells, proteins and lipids, allowing the formation of inflammation, premature aging, malignant neoplasms and neurodegenerative diseases. Thus, chemical components such as flavonoids and polyphenols present in black tea are targets of a growing interest in scientific research.

Black tea and green tea have similar chemical components, both of which have a large amount of catechins such as epicatechin (EC), epicatechin gallate (ECG), epigallocatechin (EGC), and epigallocatechin gallate (EGCG). (Sharma and Rao, 2009; Singh et al., 2011b; Singh and Katiyar, 2013). However, during the manufacture of black tea, where the leaves of these are subjected to a fermentation process, the polymerization and condensation of catechins occurs in theaflavins and thearubigins, which are

Some scientific studies have attributed the pharmacological effects observed by the consumption of black tea as a consequence of the abundance of the polyphenolic compounds theaflavins and thearubigins that, besides promoting the flavor, odor and characteristic color of the tea, present a high antioxidant potential with respect to cellular proliferation, regulation of aging and apoptosis in cancer cells of lineage. (Butt et al., 2014; Singh et al., 2017).

This study aims to, through a review, report the presence of those chemical groups present in tea with the antioxidant therapeutic effects caused by its consumption.

attributed to the antioxidant activity of the tea. (Li et al., 2013).

Studies have shown that flavonoids, mainly theaflavins and thearubigins, are responsible for reducing the damage caused by free radicals through electron donation mechanisms to stabilize such radicals, activation of antioxidant enzymes and inhibiting oxidases. (Prakash et al., 2007, Singh et al., 2017). And, it has been shown that this protective effect was associated with increased endogenous antioxidants, including SOD, CAT, GR, GPx, GST, GSH and total thiol.

It is reported in the literature, in a number of studies, the ability of black tea in cancer prevention through inhibition of DMBA-induced carcinogenesis (Chandra Mohan et al., 2005). It has also been documented that this effect is associated with inhibition of oxidative stress and formation of neoplastic lesions. In addition, black

tea was also found to inhibit tumor invasion and cell proliferation. (Singh et al., 2017).

### 3. Materials and Methods

Was performs an integrative literature review using scientific articles published in online databases. The articles found were selected according to the research objective. After reading the articles, a summary of the articles was made. In order to perform the bibliographic research, the

databases pubmed, Scielo and BVS were used, using as descriptors: *Camelia sinensis*, black tea, polyphenols and antioxidant effects. The following filters were used: full text in English and Portuguese in the last 10 years.

### 4. Conclusions

The present study enabled the elucidation of the main chemical components present in black tea and their respective effects in the fight against free radicals. The high presence of polyphenols and flavonoids in tea, allows their ability to inhibit cell damage due to oxidative stress by increasing the concentration of endogenous antioxidants and stabilizing unstable radicals. Thus allowing the development of a protective action in the fight against diseases related to oxidative stress.

### Author Contributions

The chemical components present in the various types of infusions made from the leaves of *Camelia sinensis* were shown to possess essential chemical groups in the antioxidant action. The deepening of pharmacobotanical and pharmacological studies using this plant may enable the discovery of important means for the treatment of cancer.

### Conflicts of Interest

Authors declare no conflict of interest.

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