Exploring the Nigerian Medicinal Plants with Anticancer Activities: A Pharmacological Review

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To cite this article: Abdullahi Danbaba Abdullahi, Rabiatu Kabir Mustapha, Sani Yau, Mustapha Sani Adam. Exploring the Nigerian Medicinal Plants with Anticancer Activities: A Pharmacological Review. Modern Chemistry. Vol. 6, No. 2, 2018, pp. 35-38. doi: 10.11648/j.mc.20180602.14

Received: June 8, 2018; Accepted: August 13, 2018; Published: September 28, 2018

Abstract: Cancer has become one of the most dangerous diseases and is the leading cause of death in economically developed countries and the second leading cause of death in developing countries. Many indigenous plants are used in herbal medicine to cure various diseases and heal injuries. The use of medicinal plants has become essential due to the presence of several bioactive substances and their availability. Most chemotherapeutic drugs for cancer treatment are molecules identified and isolated from plants or their synthetic derivatives. Anticancer agents from plants currently in clinical use are categorized into four main classes of compounds including; epipodophylltoxins, taxanes camptothecins, and vinca alkaloids. This paper discussed the factors responsible for, different forms of cancer, as well as organs or parts it affect. The paper also explored some Nigerian medicinal plants with anticancer agents. Seventeen medicinal plants were mentioned and confirmed to possess bioactive constituents responsible for cancer therapy.

Keywords: Anticancer, Cancer, Medicinal Plants, Phytochemicals, Pharmacological Properties

1. Introduction

Cancer is an abnormal growth and proliferation of cells. Chavan et al., [1] stated that, cancer is an abnormal growth of cells that grows and spreads through uncontrolled cell division. Cancer cells usually invade and destroy normal cells [2-3]. It is a complex genetic disease that is caused primarily by environmental factors (food, water, air, chemical, as well as sunlight that people are exposed to) [4]. It may be uncontrollable and incurable, and may occur at any time, age and any part of the body [5-6]. Cancer is the leading cause of death in economically developed countries and the second leading cause of death in developing countries [7]. Cancers are named according to the type of cell the tumor resembles, e.g carcinoma if they arise from the epithelia cell lining, sarcoma when they arise from mesodermal cell lining-muscles, bones, cartilage and connective tissue, lymphoma when they arise from cells of immune system, leukemia if they arise from cells of bone marrow [8]. Joshi [6] stated that, the most prevalent types of cancer includes that of lung, liver, cervical, colon, prostate, and breast cancer. It is well known that cancer is second to cardiovascular disease as a natural cause of death. Most of the synthetic chemical agents currently being used in cancer therapy today are toxic and therefore potentially cause damage to normal cells [9-10]. Many plants have been investigated in order to obtain new, effective and safe antioxidant and anticancer drugs, as well as to study their mode of action of cancer cell inhibition [9-10].

2. Medicinal Plants in Cancer Therapy

Plants have been used for medical purposes since the beginning of human history and are the basis of modern natural medicine. Many herbs have been used for their medicinal properties and exhibited various biological activities such as anticancer activity. Several medicinal plants have been investigated and some have been used as therapeutic agents for cancer treatment [10]. The use of medicinal plants has become essential due to the presence of several bioactive substances and their availability. Most chemotherapeutic drugs for cancer treatment are molecules identified and isolated from plants or their synthetic derivatives. Anticancer agents from plants currently in clinical use are categorized into four main classes of compounds including; epipodophylltoxins, taxanes camptothecins, and vinca alkaloids.
Anticancer Activities: A Pharmacological Review

3. Medicinal Plants with Anticancer Compounds

Several articles, both published and unpublished reported the possession of anticancer activity in plants due to the availability of some bioactive substances present. The following are among the plants with anticancer agents:

\textit{Allium sativum} is a member of family liliaceae, and contains many compounds that are helpful in prevention and treatment of different types of cancers. Allicin, a compound possessing antioxidant and anticancer activities were isolated from \textit{A. sativum} [4].

A new anticancer sesquiterpene lactone and vernodal were isolated from \textit{Vernonia amagdalina} [24].

Reference [7] reported the presence of chemical compound known as lycopene in \textit{Solanum lycopersicum} which is a potent antioxidant that attacks roaming oxygen molecules which are suspected of triggering cancer. Consumption of \textit{S. lycopersicum} products is associated with a decreased risk of developing prostate cancer, and might contribute to chemoprevention activity, this is due to the present of lycopene.

\textit{Ipomoea batatas} known as dankalin Hausa in northern Nigeria, belong to the family convolvulaceae. Numerous studies reported that, 4-ipomeanol a natural cytotoxic as well as a stress metabolites was isolated from \textit{I. batatas} [25]. Mohanraj and Subha [26] in another study also reported the presence of this bioactive substances.

\textit{Catharanthus roseus} is an important medicinal plant belonging to the family apocynaceae, and is mainly cultivated for its alkaloids and possess an anticancer activity [27]. It was reported to contained vinblastine, vincristine [5, 28] vindesine, and vinorelbine [5]. The presence of these phytoconstituents especially, vinblastine and vincristine makes \textit{C. roseus} one of the good anticancer agent.

\textit{Spondia mombin} popularly known as Tsadar masar in northern Nigeria is a member belonging to the family anacardiaceae. \textit{S. mombin} is a fructiferous tree that thrives in the rainforests and coastal areas of Africa, also widely found in tropical America, Asia and Africa and has been recently cultivated in commercial quantities in Mexico [10].

\textit{S. dulcis} known as Rumafada in northern Nigeria, belong to the family scrophulariaceae. Reference [29] reported the anticancerous activity of the plant due to the presence of scopadulic acid.

\textit{A. aspera} Linn has been used for many ailments among which are diabetes, liver disorders, asthma, pneumonia, leucoderma, gynecological disorders and others. The plant belong to the family amaranthaceae is one of the most useful herbs used in the herbal medicine and Ayurveda. Pharmacological and toxicity study conducted on this plant showed the presence of oleanolic acid a naturally occurring triterpenoids and ursolic acid an anticancer agents [30].

\textit{S. prionitis} a member of the family labiatae were reported to possess salvicine a diterpenoid quinone which is a derivative of naturally occurring saprothequinone compound [4].

Acetogenins is a compound which possess significant cytotoxic activity against leukemia and sarcoma were isolated from \textit{Annona} species [15]. The compounds were found to be effective in the treatment of nasopharyngeal carcinoma [15].

\textit{Curcuma longa} is a member of the family Zingiberaeace, are reported to be used in the treatment of leukemia, lymphoma, gastrointestinal cancers, genitourinary cancers, breast, melanoma, neurological, lung, ovarian head and neck squamous carcinoma [4]. The anticancer activity of this plant were found to be due to the presence of curcumin, flavonoids, and other bioactive substances [31].

A member of a family Nyssaceae known as \textit{camptotheca
acuminata were reported to possessed camptothecin an excellent anticancer agent. Several studies indicated the efficacy of this compound [3]. Terminalia chebula is a member of the Combretaceae family. Phenols like chebulinic acid, ellagic acid, tannic acid are the cancer growth inhibitors found in the fruit of T. chebula [3].

Table 1. Medicinal plants with anticancer activity.

<table>
<thead>
<tr>
<th>Plants</th>
<th>Family</th>
<th>Local name</th>
<th>Compounds</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. batatas</td>
<td>Convolvulaceae</td>
<td>Dankali</td>
<td>4-ipomeanol</td>
<td>25-26</td>
</tr>
<tr>
<td>C. roseus</td>
<td>Apocyanaceae</td>
<td></td>
<td>Vincristine, vinblastine, vindesine, vinorelbine</td>
<td>5, 27-28, 33-34</td>
</tr>
<tr>
<td>V. amagdalina</td>
<td>Liliaceae</td>
<td>Shuwaka</td>
<td>Vernodalin</td>
<td>24</td>
</tr>
<tr>
<td>A. sativum</td>
<td>Solanaceae</td>
<td>Tumatir</td>
<td>Aillicin</td>
<td>4</td>
</tr>
<tr>
<td>S. mombin</td>
<td>Anacardiaceae</td>
<td>Tsadar masar</td>
<td>Lycopene</td>
<td>7</td>
</tr>
<tr>
<td>Z. officinale</td>
<td>Zingiberaceae</td>
<td>Citta</td>
<td>Curcumin, zingerone</td>
<td>32</td>
</tr>
<tr>
<td>C. maxima</td>
<td>Rutaceae</td>
<td></td>
<td>Flavonoids, limonoids</td>
<td>16</td>
</tr>
<tr>
<td>M. oleifera</td>
<td>Moringaceae</td>
<td>Zogale</td>
<td>Isothiocyanate, beta-sitosterol</td>
<td>16</td>
</tr>
<tr>
<td>S. dulcis</td>
<td>Scrophulariaceae</td>
<td>Rumafada</td>
<td>Scopadulic acid</td>
<td>29</td>
</tr>
<tr>
<td>A. aspera</td>
<td>Amaranthaceae</td>
<td></td>
<td>Oleanolic and ursolic acid</td>
<td>30</td>
</tr>
<tr>
<td>S. priuensis</td>
<td>Labiatae</td>
<td></td>
<td>Salvicine</td>
<td>4</td>
</tr>
<tr>
<td>G. biloba</td>
<td>Ginkgoaceae</td>
<td></td>
<td>Ginkgolide-</td>
<td>15</td>
</tr>
<tr>
<td>Annona</td>
<td>Annonaceae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. longa</td>
<td>Zingiberaceae</td>
<td></td>
<td>Curcumin, flavonoids</td>
<td>4, 31</td>
</tr>
<tr>
<td>C. acuminata</td>
<td>Nyssaceae</td>
<td></td>
<td>Camptothecin</td>
<td>3</td>
</tr>
<tr>
<td>T. chebula</td>
<td>Combretaceae</td>
<td></td>
<td>Ellagic acid, tannic acid, chebulinic acid</td>
<td>3</td>
</tr>
</tbody>
</table>

4. Conclusion

Medicinal plants are used to prevent prostate, colon, and gastric cancers. It is also used to prevent skin cancer or damage from ultraviolet radiation. The use of medicinal plants reduce the risk of some cancers by preventing blood vessel growth in tumors. Identification of medicinal plants with significant cytotoxic potential useful for the development of cancer therapeutics has gained increasing importance in the last decade, and research in this field is still expanding. Nigeria is naturally endowed with different medicinal plants and responsible for different pharmacological activities including anticancer. All the medicinal plants presented in this paper possess anticancer activities and are widely used in different communities across the country.

References


