

Review Article

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

Abdullahi Danbaba Abdullahi^{1,*}, Rabiata Kabir Mustapha², Sani Yau^{3,4}, Mustapha Sani Adam¹

¹Department of Chemistry, School of Science Education, Sa'adatu Rimi College of Education, Kumbotso, Nigeria

²Department of Chemistry, Faculty of Science, Yusuf Maitama Sule University, Kofar Nasarawa, Nigeria

³Child Development Centre, Sa'adatu Rimi College of Education, Kumbotso, Nigeria

⁴Consultancy Unit, Sa'adatu Rimi College of Education, Kumbotso, Nigeria

Email address:

abdullahidan@yahoo.com (A. D. Abdullahi)

*Corresponding author

To cite this article:

Abdullahi Danbaba Abdullahi, Rabiata 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; epipodophyllotoxins, 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

medicine [11]. Due to the low economic rate of the majority of population in developing countries and high cost of western medicine, natural products or medicinal plants has a long and uninterrupted history of continuous usage by a large proportion of the population in the developing countries [12]. Medicinal plants are considerably serviceable and economically needed [13]. In Nigeria and other countries, many indigenous plants are used in herbal medicine to cure various diseases and heal injuries [14]. According to WHO, 80% of the world population living in the rural areas depend on medicinal plants as primary health care system [7, 15-17]. Plants have been proven to be a novel source for bioactive natural products, their ethnopharmacological effects have been used as a primary source for drug discovery [18]. Gulzar *et al.*, [19] reported that, the lead of many important pharmaceuticals currently in use have been plants use by indigenous people. Solowey *et al.*, [11] observed that, most chemotherapeutic drugs for cancer treatment are molecules identified and isolated from plants or their synthetic derivatives. According to Okorundu *et al.*, [20] medicinal plants has shown promising anticancer activities. Drug discovery from medicinal plants has play a crucial role in the treatment of cancer [21]. Rumana *et al.*, [22] suggested that, consumption of diet containing fruits and vegetables which are the major sources of phytochemicals and micronutrients reduce the risk of developing cancer. Secondary metabolites like polyphenols, alkaloids, terpenes have been reported to possess antimutagenic and anticancer properties in many studies [5]. Anticancer agents from plants currently in clinical use can be categorized into four main classes of compounds including; camptothecins epipodophylltoxins, taxanes camptothecins, and vinca alkaloids [21]. Several researches on cancer drugs and discovery of new lead molecules towards anticancer activity by using medicinal plants was put forward because they are reservoirs of antioxidant and possess no toxicity as compared to the modern drugs [12]. Despite the advancement in the cancer therapies which include chemotherapy and radiation therapy, the mortality rate associated with cancer has remain high. Plants have been looked upon as the substitute and several have been evaluated in an effort to discover novel, potential anticancer compounds with no toxic effects [23].

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:

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

A new anticancer sesquiterpene lactone and vernodalin

were isolated from *Vernonia amagdalina* [24].

Reference [7] reported the presence of chemical compound known as lycopene in *Solanum lycopersicum* which is a potent antioxidant that attacks roaming oxygen molecules which are suspected of triggering cancer. Consumption of *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.

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

Catharantus roseus is an important medicinal plant belonging to the family apocyanaceae, 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 *C. roseus* one of the good anticancer agent.

Spondia mombin popularly known as Tsadar masar in northern Nigeria is a member belonging to the family anacardiaceae. *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].

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 scopadulcic acid.

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].

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

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

Curcuma longa is a member of the family Zingiberaceae, 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 *camptotheca*

acuminata were reported to possessed campothecin 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.

Plants	Family	Local name	Compounds	References
<i>I. batatas</i>	Convolvulaceae	Dankali	4-ipomeanol	25-26
<i>C. roseus</i>	Apocyanaceae		Vincristine, vinblastine, vindesine, vinorelbine	5, 27-28, 33-34
<i>V. amagdalina</i>		Shuwaka	Vernodalinal	24
<i>A. sativum</i>	Liliaceae		Allicin	4
<i>S. lycopersicum</i>	Solanaceae	Tumatir	Lycopene	7
<i>S. mombin</i>	Anacardiaceae	Tsadar masar		10
<i>Z. officinale</i>	Zingiberaceae	Citta	Curcumin, zingerone	32
<i>C. maxima</i>	Rutaceae		Flavonoids, limonoids	16
<i>M. oleifera</i>	Moringaceae	Zogale	Isothiocyanate, beta-sitosterol	16
<i>S. dulcis</i>	Scophulariaceae	Rumafada	Scopadulcic acid	29
<i>A. aspera</i>	Amaranthaceae		Oleanolic and ursolic acid	30
<i>S. prionitis</i>	Labiatae		Salvicine	4
<i>G. biloba</i>	Ginkgoaceae		Ginkgolide-	
<i>Annona</i>	Annonaceae			15
<i>C. longa</i>	Zingiberaceae		Curcumin, flavonoids	4, 31
<i>C. acuminata</i>	Nyssaceae		Campothecin	3
<i>T. chebula</i>	Combretaceae		Ellagic acid, tannic acid, chebulinic acid	3

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

- [1] Chavan S. S. *et al.*, (2013). Traditional medicinal plants for anticancer activity. *International Journal of Current Pharmaceutical Research*, 5(4): 50-54.
- [2] Madhuri S. and Pandey G. (2009). Ethnomedicinal plants for prevention and treatment of tumours. *International Journal of Green Pharmacy*, 3(1):2-5.
- [3] Prakash O. M. *et al.*, (2013). Anticancer potential of plants and natural products: A review. *American Journal of Pharmacological Sciences*, 1(6): 104-115.
- [4] Kainsa S. *et al.*, (2012). Medicinal plants of Asian origin having anticancer potential: short review. *Asian Journal of Biomedical and Pharmaceutical Sciences*, 2(10): 1-7.
- [5] Umadevi M. *et al.*, (2013). Traditionally used anticancer herbs in India. *Journal of Medicinal Plants Studies*, 1(3): 56-
- [6] Joshi R. A. (2017). *Antrodia camphorata* with potential anti-cancerous activities: A review. *Journal of Medicinal Plants Studies*, 5(1): 284-291.
- [7] Amri E. (2014). The role of selected plants families with dietary Ethnomedicinal species used as anticancer. *Journal of Medicinal Plants Studies*, 2(1): 28-39.
- [8] Sultana S. *et al.*, (2014). Medicinal plants combating against cancer- a green anticancer approach. *Asian Pacific Journal of Cancer Prevention*, 15: 4385-4394.
- [9] Hussein A. *et al.*, (2014). Antioxidant and cytotoxic activities of *Gmelina arborea* ROXB. leaves. *British Journal of Pharmaceutical Research*, 4(1):125-144.
- [10] Ibikunle G. F. *et al.*, (2017). Cytotoxic agents from Nigerian plants: A case study of *Spondias mombin* Linn (Anacardiaceae) leaves. *FUW Trends in Science and Technology Journal*, 2(1b): 510-513.
- [11] Solowey E. *et al.*, (2014). Evaluating medicinal plants for anticancer activity. *The Scientific World Journal*, 1-13.
- [12] Priya L. M. *et al.*, (2015). Herbal and medicinal plants molecules towards treatment of cancer: A mini review. *American Journal of Ethnomedicine*, 2(2): 136-142.
- [13] Verma S. (2017). Phytochemical and pharmacological study on *Argemone mexicana* Linn (Papaveraceae). *International Journal of Pharmacy*, 7(1): 90-93.
- [14] Omale J. and Okafor P. N. (2009). Cytotoxicity and antioxidant screening of some selected Nigerian medicinal plants. *Asian Journal of Pharmaceutical and Clinical Research*, 2(4): 48-53.
- [15] Sakarkar D. M. and Deshmukh V. N. (2011). Ethnopharmacological review of traditional medicinal plants for anticancer activity. *International Journal of PharmTech Research*, 3(1):
- [16] Merina N. *et al.*, (2012). Medicinal plants with potential anticancer activities: A review. *International Research Journal of Pharmacy*, 3(6): 26-30.

- [17] Mbhele N. *et al.*, (2015). In vitro studies on the antimicrobial, antioxidant, and antidiabetic potential of *Cephalaria gigantea*. *Bangladesh Journal of Pharmacol*, 10: 214-221.
- [18] Ahmad H. A. (2017). A Phyto pharmacological review on a medicinal plants: *Holarrhena floribunda*. *Journal of Medicinal Plants Studies*, 5(6): 26-29.
- [19] Gulzar H. *et al.*, (2015). Phytochemical screening, antimicrobial and anticancerous activities of two plants extract. *Journal of Medicinal Plants Studies*, 3(6): 76-81.
- [20] Okorondu S. I. *et al.*, (2015). Review on medicinal plants. *Nigerian Journal of Microbiology*, 29: 3167-3183.
- [21] Mushtaq S. (2017). Evaluation of anticancer and antimicrobial activities of selected medicinal plants of Kashmir Himalayas, India. *Indian Journal of Traditional Knowledge*, 16(1): 141-145.
- [22] Rumana A. *et al.*, (2015). Evaluation of *In-vitro* anticancer activity of stem of *Tinospora cordifolia* against human breast cancer and vero cell lines. *Journal of Medicinal Plants Studies*, 3(4): 33-37.
- [23] Tiwary B. K. *et al.*, (2015). The in vitro cytotoxic activity of ethnopharmacological important plants of Darjeeling district of west Bengal against different human cancer cell lines. *BMC Complementary and Alternative Medicine*, 15(22): 1-10.
- [24] Nwankwo J. O. (2017). Anticancer potentials of phytochemicals from some indigenous food and medicinal plants of west Africa. *Advances in Cancer Prevention*, 2(3): 1-7.
- [25] Mohanraj R. and Subha S. (2015). Production of 4-ipomeanol, an anticancer agent from the root tuber and rhizogenic callus of *Ipomoea batatas* Lam: A comparative study. *Indian Journal of Experimental Biology*, 53: 297-304.
- [26] Mohanraj R. and Subha S. (2014). Sweet potato (*Ipomoea batatas* [L.] Lam) - A valuable Medicinal food: A Review. *Journal of Medicinal Food*, 17(7): 733-741.
- [27] Kaushik P. *et al.*, (2014). A comprehensive review on medicinal plants with anticancer activity. *Global Journal of Pharmaceutical Education and Research*, 3(1-2): 1-13.
- [28] Singh D. K. and Luqman S. (2014). *Lawsonia inermis* (L.): A perspective on anticancer potential of Mehndi/Henna. *Biomedical Research and Therapy*, 1(4): 112-120.
- [29] Hayashi K. *et al.*, (2004). Evaluation of Scopadulciol-Related Molecules for their stimulatory effect on the cytotoxicity of acyclovir and gancyclovir against herpes simplex virus type I Thimidine kinase gene Transfected HeLa cells. *Chem. Pharm. Bull.* 58(2):1015-1017.
- [30] Liu J. (2005). Oleanolic acid and Ursolic acid: Research perspectives. *Journal of Ethnopharmacology*, 100(1-2): 92-94.
- [31] Akram M. *et al.*, (2010). *Curcuma longa* and Curcumin: A review article. *Romanian Journal of Biology and Plant Biology*, 5(2):65-70.
- [32] Polu P. *et al.*, (2015). Herbal medicinal plants as an anticancer agent. *Annals of Phytomedicine*, 4(1): 37-45.
- [33] Reddy C. M. B. and Reddy G. V. S. (2012). Validated method for vinblastine by spectrophotometry in bulk drug and pharmaceutical formulations. *Journal of Chemical and Pharmaceutical Research*, 4(7): 3703-707.
- [34] Umashanker M. and Shruti S. (2011). Traditional indian herbal medicine used as antipyretic, antiulcer, antidiabetic and anticancer: A review. *International Journal of Research in Pharmacy and Chemistry*, 1(4): 1152-1159.