Chemo-Prophylaxis and Medicinal Values of *Vernonia amygdalina* and its Uses: A Review

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Abstract

Vernonia amygdalina, often known as bitter leaf, is a useful fodder tree with a high biomass yield, ease of planting, adaptability, and compatibility with other crops that can tolerate bitter leaf for soil fertility or moisture, rather supporting perennial crop growth and soil fertility. Bitter leaf is a plant that has been long used as a phytotherapeutic. In traditional medicine, it's thought to have a number of medicinal chemicals that aid in the treatment and management of range of ailments. In ethno-medicine, the leaves of the bitter leaf plant are used to cure a variety of ailments, such as fever, renal issues, gastroenteritis, vomiting, diarrhoea, and dysentery. The young shoots and leaves are prepared as vegetables and are a good source of protein, vitamins, and minerals. One of the leafy vegetables that has been used to address the issue of micronutrient deficiency and malnutrition is bitter leaf, which is highly common in tropical Africa. The plants are common and rich in numerous minerals, especially vitamin C and â-carotene, which are essential for human health. Additionally, it is rich source of minerals including calcium, iron, phosphorus, and potassium. Ascorbic acid, proteins, iron, carotene, folic acid, and dietary anaemia components are all abundant in bitter leaf. Animal tests revealed that the leaves of V. amygdalina exhibited hypoglycaemic and hypolipidemic characteristics, indicating that they may be utilised to treat conditions like diabetes. This article examines the bitter leaf's (Vernonia amygdalina) therapeutic and preventative uses

Keywords: Bitter leaf, Nutritional, Medicinal, Animals, Humans

Introduction

African and Asian regions are well-known for their bitter leaf (*Vernonia amygdalina*) plants. Of the a thousand species in the Vernonia genus, it is the one that is cultivated the most (Agbogidi and Akpomorine, 2013; Egharevba et al., 2014). The Asteraceae plant known as bitter leaf (*Vernonia amygdalina*) was extensively researched in Africa (Ankit et al., 2010; Farombi and Owoeye, 2011; Ijeh and Ejike, 2011). It is a tiny shrub with rough bark and dark-green foliage that is mostly found in the tropics, has been subjugated throughout much of West Africa countries (Igile et al., 1994). It is a perennial plant with a height range of one to six metres (Nwosu et al., 2013). Although bitter leaf doesn't typically produce seeds, it does most of its propagation by stems in tropical areas. Bitter leaf can frequently be found in drainages, forests, and commercial plantations (Yeap et al., 2010).

The Plants contain anti-nutritive compounds that are the source of the bitter flavour (Bonsi et al., 1995). As a green leafy vegetable, bitter leaf is eaten. It is essential to the human diet due to its mineral and vitamin content (Sobukola et al., 2007).

Bitter leaf (*Vernonia amygdalina*) can be used as an effective fodder tree with a high biomass output, ease of planting, adaptable and compatible with other crops that are tolerant with bitter leaf for soil fertility or moisture, rather support perennial crop growth and soil fertility. Despite these realities, the plant is employed across the nation to address a wide range of issues relating to the health of both people and animals (Mekoya *et al*., 2008; Alem, and Woldemariam, 2009). It has anti-diabetic, hypoglycemia, and cholesterol-lowering properties. *Vernonia amygdalina* is a well-known herbal medicine (Kigigha, *et al*., 2015; Owen *et al*., 2011). Bitter leaf is a typical remedy for ailments like fever, hiccups, kidney problems, and stomach pains in human ethnomedicine (Burkill 1985; Hamowia and Safran, 1994).

Bitter leaf (*Vernonia amygdalina*) is believed to contain a number of active compounds that help in the treatment and management of a number of illnesses long employed as a phytotherapeutic plant in traditional medicine. The leaves of the bitter leaf plant are used in ethno-medicine to treat a wide range of conditions, including fever, kidney problems, gastroenteritis, vomiting, diarrhoea, and dysentery (Ali *et al*. 2019). Local craftsmen have produced *Vernonia amygdalina* roots, stems, and leaves using a number of solvents, such as alcohol and, water and their solutions have been used to cure eczema as well as malaria. Many West African nations have used *V. amygdalina* leaves successfully to make soup, serve as an appetiser, and augment weaning diets (Gberikon *et al*. 2019).In animal, *V. amygdalina* leaves were found to exhibit hypoglycaemic and hypolipidemic qualities, suggesting that they could be used to treat diseases like diabetes (Akah *et al*., 2008).

This paper aim to review the medicinal function of bitter leaf (*Vernonia amygdalina*)

Antibacterial Properties

V. amygdalina has an antibacterial capability, according to numerous studies. Newbold *et al*. (1997); Kambizi and Afolayan (2001) found that *Vernonia amygdalina* possess acetone extract which can serve an antibacterial against most harmful bacterial. In a study by Cos *et al*. (2002), he observed that gram positive bacteria are more sensitive to *Vernonia amygdalina* than gram negative bacteria. Babalola and Okoh (1996) suggested that bitter leaf plant could be of great importance in beer industry due to its ability to inhibit the growth of some bacteria such as *Aerococcus viridans, Bacillus circulans,* and *Clostridium perfringens*, while promoting the production of alcohol by brewer's yeast. Kola (2007), on the other hand, asserted that the antibacterial activity of its ethanolic leaf extract against *C. sporogenes* was capable of restoring baseline blood, protein, and bilirubin urinary levels, as well as increasing neutrophil, leukocyte, and haematocrit in blood, reducing infection-induced haemolysis.

Anti-inflammatory Properties

Inflammation is an immune reaction to damaged cells, infection, irritants, mechanical, and chemical insults, with the goal of removing damaging stimuli and initiating the healing process of the damaged tissue (Chen, *et al*., 2018). *Vernonia amygdalina* according to Ibrahim *et al.,* (2001)contain saponin which is an effective anti-inflammatory substance. This was observes in a Wister rat's ear with xylene-induced acute inflammation. Response to the anti-inflammatory effect of *Vernonia amygdalina* was dose-dependent, with the leaf extract having a larger percentage inhibition than the root extract. In comparison to the extracts, the *Vernonia amygdlina* saponin extract had a decreased but still considerable inhibitory efficacy. Bitter leaf extracts have anti-inflammatory action comparable to that of Dexamethasone which could be explained in part by the presence of compounds such as tannins, glycosides, flavonoids and trace elements such as copper, manganese, and zinc, which have been found in earlier studies (Ibrahim *et al*., 2001). These compounds have been shown to have anti-inflammatory properties according to earlier researches (Kim *et al*., 2004; Okokon and Onah 2004; Bittar *et al*., 2000; DiSilvestro and Marten 1990).

Antioxidant Effect

The concentrate of *Vernonia amygdalina* have been observed to have antioxidant properties by searching for free radicals in the cells. The malon dialdehyde levels of oxidatively challenged streptozotocin-induced diabetic rats were significantly reduced by aqueous extracts from the leaf (Nwanjo, 2005). The leaf extracts' capacity to search Azino-Bis-3-EthylbenzThiazoline-6-Sulphonic acid (ABTS) radicals at 96.2% and Diphenyl-2-picrylhydrazy (DPPH) radicals at 75-99.3% was examined (Erasto *et al*., 2007). Flavonoids have been connected to the antioxidant properties of *V. amygdalina* extracts (Ayoola *et al*., 2008; Farombi and Owoeye, 2011). Singnificant increase was observed in a biochemical study of bitter leaf applied in vivo in rat, the levels of the antioxidants catalase, superoxide dismutase, malondialdehyde and glutathione. Additionally, compared to the control group, rats given daily dosages of the extracts showed a lower lipid profile (Imaga and Bamigbetan, 2013). According to Amodu *et al*. (2013), Bitter leaf possess the ability to disrupt the binding of particular transcription factors of the DNA, promote detoxification and scavenge for free radical cells. This abilities explains better the chemo-preventive properties of *Vernonia amygdalina*

Chemo-preventive Properties

The in vitro chloroform extract of *Vernonia amygdalina* inhibits human nasopharyngeal cancer cells when they are carried in tissue culture (Kupchan *et al*. 2003). In vitro, the aqueous extract hampers the development of MCF-7 human breast carcinoma cells. In vivo, this could indicate tumor stabilization or prevention. A Fragment of *Vernonia amygdalina* extract were discovered to suppress synthesis of DNA using the reverse-phase HPLC method (Cimanga *et al*. 2004; Izeybigie. 2003; Yedjou *et al*. 2008).

According to Yedjou *et al*. (2008), *Vernonia amygdalina* solvents are a DNA-damaging anti-cancer drug for breast cancer, and their mechanisms of action involve, at the very least, mildly disrupting tumour cell DNA and generating moderate toxicity. Mechanistic studies show that *Vernonia amygdalina* extract acts as a mono functional inducer in MCF-7 breast cancer cells. Despite not affecting CYP1A1/1A2 mRNA expression, *Vernonia amygdalina's* ability to treat cancer was supported by its ability to stimulate Microsomal Epoxide Hydrolase (MEH) (Howard *et al*. 2003)

Nutritional Values and Chemical Composition of V. Amygdalina

The leaves and young shoots are cooked as vegetables, rich in protein, vitamins and mineral elements. Bitter leaf is one of the leafy vegetables that have been used to alleviate the problem of micronutrients, malnutrition and it is very prominent in tropical Africa (Ejoh, *et al*. 2005). The leaves are reasonably priced and abundant in many nutrients, particularly â-carotene and vitamin C, which are critical for human health. It also contains a lot of minerals like potassium, phosphorus, calcium and iron (Musa, *et al*. 2011). Additionally, bitter leaf is high in ascorbic acid, proteins, iron, carotene, folic acid, and dietary anaemia constituents (Abosi, and Raseroka, 2003).Carotene normalizes the synthesis of female sex hormones, allowing women to stay young and healthy for long. In industrial countries, bitter leaf is used for their fortification of some common foods. The micronutrients in bitter leaf include: iron, magnesium, copper, sodium, zinc and potassium (Aliyu, and Morufu, 2006).

In conclusion, bitter leaf (*Vernonia amygdalina*) possesses numerous bioactivities, nutritional, and anti-oxidant properties. This made its usage widely preached ad acknowledge in human and animal nutrition. It is used widely as supplements in most human and animal diets as a replacement for antibiotics.

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