Review on Selected Toxic, Narcotics and Psychoactive Plants Used in Nigeria

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ABSTRACT

One in seven Nigerians aged 15 to 64 had used illicit substances (other than tobacco and alcohol) in the past year, with significant numbers suffering from drug-related disorders. Cannabis, known as marijuana or Indian hemp, contains THC, which affects brain receptors. Short-term effects include mood swings, memory loss, and poor coordination, while regular use can lead to anxiety, depression, and respiratory problems. Nigeria has strict laws against cannabis use, with severe penalties for possession and distribution. Tobacco is widely used for its nicotine content. Short-term effects include high blood pressure and increased heart rate, while long-term use can lead to lung cancer and heart disease. Smoking is legal in Nigeria, but there are efforts to reduce tobacco usage through taxes and health campaigns. Khat, or miraa, contains cathinone, causing similar short-term effects as tobacco. Though illegal in Nigeria, it remains used in some Northern communities. Datura stramonium, or jimsonweed, contains harmful substances that can cause hallucinations. Its use is also illegal in Nigeria, its traditional medicine practices can be risky despite potential benefits. The purpose of this review is to develop a review of current research on toxic, narcotic, psychoactive plants and ecological risk assessment, as well as to point out deficiencies and to offer motivation for enhancing the research level in this field. Research on psychoactive plants is being conducted progressively, and significant progress has been made in the aspects of occurrence. Nevertheless, there are some areas for improvement and more research needs be carried on the selected plants as well as other plants in existence.

Keywords: Toxic, Psychoactive, Nigeria, Tobacco, Medicine, Datura.

INTRODUCTION

Worldwide, plants have long been known to have therapeutic chemicals that are utilized to cure and prevent a variety of illnesses (Mahoomdally, 2013). According to Saini *et al.,* (2009), the vast majority of people worldwide roughly 80% accept plants as an essential source of medications that are required to preserve health. Notwithstanding the aforementioned health benefits of plants, depending on the type of plant, some of its chemical constituents may be toxic to humans in high, moderate, or even low dosages (Fennell *et al.,* 2004). While some of these dangerous substances only affect certain organs, others might affect the entire organ system. For example, the cardiac glycosides thevetin A and B, digitoxin, oleandrin, and neriifolin target the heart (Bandara *et al.,* 2010). The species, state or

condition, developmental stage, plant component used, quantity consumed, and vulnerability of the victim can all influence the prevailing effect (Botha and Penrith, 2008). Nigeria, a tropical nation, is known to have a wide range of plants with high concentrations of heterogeneous chemical compounds, including alkaloids, tannins, flavonoids, saponins, anthraquinones, glycosides, and proteins (Ajaiyeoba *et al.,* 2006).

The risk for toxicity from inappropriate administration is increased by the current absence of good control of the use of therapeutic plants in Nigerian traditional medicine practices, especially for those plants that are harmful in little amounts (Fennel *et al.,* 2004). The possibility of genotoxicity linked to long-term exposure to the most widely used medicinal herbs is another matter of worry (Sowemimo *et al.,* 2007). Psychoactive substance abuse is still a major global public health and financial concern (Soremekun *et al.,* 2021). Two signs of this worldwide problem are the high prevalence of drug-related health problems and the lack of sufficient data on the prevalence of psychoactive substance addiction in developing and impoverished regions (Adejoh *et al.,* 2024). On the other hand, it is well known that the developed world struggles to control and prohibit the use of psychoactive chemicals (UNODC, 2018). Determining the extent of substance misuse is complicated and challenging for several reasons, such as the range of chemicals that are abused, health issues, social stigma that results in silence, and various legal overtones surrounding their usage globally (Khaw *et al.,* 2020).

Between 2009 and 2018, the United Nations Office on Drugs and Crime (UNODC) conducted numerous research on the pervasive use of psychoactive substances in Nigeria (UNODC 2018, 2019). Other indigenous studies have evaluated *Datura stramonium, Nicotiana tabacum*, and other plants with limited information about their psychoactive components as psychoactive plants. These include dry *Carica papaya, Manihot esculenta, and Moringa oleifera,* among others (Abdurahman *et al.,* 2019; Dumbili 2020; Dumbili *et al.,* 2021). Several studies have identified the chemical components or phytochemical composition of certain toxic plants. Among the plants used for medicinal purposes, it is vital to identify those that have the potential to be harmful. This will lessen the frequency of toxicity or poisoning linked to plants (Abubakar *et al.,* 2018). Additionally, it will assist researchers in determining the appropriate dosage for assessing a poisonous plant's medicinal effect. This review's objective is to present important details about Nigerian therapeutic herbs that may be toxic, psychoactive, or narcotism-prone.

Plants naturally create a wide variety of chemicals, some of which have been shown to exhibit behavior that is believed to be psychoactive. Mostly alkaloids, these substances have been shown to have a range of effects, such as hallucinogenic, sedative, euphoric, antidepressant, and memory-enhancing (Jean-Francois 2014; Fasakin *et al.,* 2021). "Psychoactive plants" are plants that have specific characteristics. Therefore, according to current research, plants that contain compounds (such alkaloids) that might alter the functioning of the central nervous and neurotransmitter systems and result in psychoactivity are considered psychoactive (Jean-Francois 2014). Because of their hallucinogenic or mind-altering

properties, these plants were referred to as "Plants of the gods" in prehistoric societies. Many civilizations have always considered them sacred and used them in religious ceremonies to communicate and communicate with beloved ancestors or gods. Others use it as an essential part of healing ceremonies (Faria, 2021).

Laws such as the 1961 Single Convention on Narcotic Drugs, which was subsequently reviewed in 1971 and 1988 by the Conventions on Psychotropic Substances and Illicit Traffic in Narcotic Drugs and Psychotropic Substances, were adopted as a result of the nineteenth-century recreational use of psychoactive plants in China during the Ching Dynasty (Feng *et al.,* 2017). In Nigeria, the Single Convention on Narcotic Drugs, 1961 (Single Convention, 1961 Convention, or C61) is an international treaty that controls activities (cultivation, production, supply, trade, transport) involving specific narcotic drugs and lays down a system of regulations (licenses, measures for treatment, research, etc.) for their medical and scientific uses, concluded under the auspices of the United Nations. The Convention also establishes the International Narcotics Control Board (Fasakin *et al.,* 2021).

However, because they excluded certain psychotropic plants that have been demonstrated to pose a risk to public health, these international drug restrictions were eventually withdrawn (Fasakin *et al.,* 2022). These excluded plants were referred to as "new psychoactive plants" (NPP) by the United Nations Office on Drugs and Crime (UNODC), and as of December 2020, 22 plants were included in the list of 1047 psychoactive substances that had been reported to the UNODC Early Warning Advisory (EWA) in 126 countries and territories (UNODC, 2020). However, in this context, the adjective "new" does not relate to a fresh innovation or discovery, but rather to compounds that are not prohibited by international drug laws (Fasakin *et al.,* 2021).

Cannabis sativa

This plant was first documented in 2737 BC, during the reign of Chinese Emperor Fu His (Bonini *et al.,* 2018). The plant was only used to make textiles and fibers before its medicinal and recreational use were discovered (Khaw *et al.,* 2020). It is the oldest, even among farmed fiber plants (Fasakin *et al.,* 2021). Since the then-emperor Chen Nung suggested *C. sativa* for rheumatism, malaria, and fatigue over 5000 years ago, it has been utilized medicinally (Bonini *et al.,* 2018). "Good for the Old and Young" was how Norman Rockwell characterized the plant in an advertisement. Prior to 1906, when the Pure Food and Drug Act prohibited the manufacturing and use of *cannabis sativa,* it remained unregulated. The Indian Hemp Drugs Commission's reports prompted this decision (Bonini *et al.,* 2018).

The United States government banned the use and cultivation of *Cannabis sativa* in 1937, and most other countries, including Nigeria, followed suit, despite the American Medical Association's (AMA) resistance (Annas, 2014). Despite the fact that *C. sativa* is still illegal for recreational use, changes in the political landscape of the majority of countries have prompted a number of reforms and positive initiatives (Bonini *et al.,* 2018, 2014; Annas, 2014; Newman *et al.,* 2021; Akingboye, 2019; Olasupo, 2019). It was carried to Nigeria by sailors and soldiers returning from the Middle East, the Far East,

and North Africa during and after World War II (Duvall, 2016). In Nigeria, the most commonly used shorthand is Indian hemp or marijuana, while the regional names are Igbó (Yoruba), wiwi (Hausa), and nwonkaka (Ibo). *C. sativa* is referred to as hemp in the industrial sector and as marijuana or cannabis in both medical and recreational contexts. In Nigeria, a hallucinogenic cocktail beverage called Skushies/Scoochies is made by combining *C. sativa* with tramadol, codeine, and colorant liquids (Dumbili *et al.,* 2021). However, when the colorant drink is replaced with vodka, the beverage is referred to as gutter water (Dumbili *et al.,* 2021).

The nation is currently the eighth-highest consumer of cannabis in the world and the first in Africa, despite the fact that it has banned the use of *C. sativa* for recreational purposes for more than 30 years and that the National Drug Law Enforcement Agency (NDLEA) has seized the most of the plant (Dumbili *et al.,* 2021). Trafficking and abuse of the plant are also on the rise (Goar, 2021). *C. sativa* production is well-established across the nation due to the country's geographic and climatic features, which provide a good environment for its development. Although 718 hectares of *C. sativa* crops and 187,394 kg of *C. sativa* medicines were destroyed nationwide in 2016, this had little effect on lowering its overuse, since the UNODC assessed that 10.8% of adults still had *C. sativa* in 2018(UNODC, 2018). Its domination was probably brought on by the plant's producers' determination to produce more cannabis plants, as producing cannabis is their primary source of income (Afsahi and Mouna, 2014). The means of exposure to folklore include chewing, dipping, drinking,

smoking, and inhaling.

Toxicity

ΔTHC (delta Tetrahydrocannabinol) is the primary poisonous ingredient in *C. sativa* (Mechoulam and Parker 2013). It has been noted that *C. sativa* causes modest and temporary behavioral, cognitive, and psychosocial toxicity (Bonini *et al.,* 2018; Faria, 2021; Wong and Baum, 2019). However, it has been demonstrated that a loss of sober mental control following recreational *C. sativa* exposure increases the likelihood of traffic accidents (Omare *et al.,* 2021). Acute, subacute/subchronic, and chronic exposures, the ratio of ΔTHC to CBD (cannabidiol), the route of exposure, the age at which use began, and the presence of pollutants have all been found to affect the neurotoxic effect of *C. sativa* (Bonini *et al.,* 2018). Due to its high lipid solubility, ΔTHC has a half-life of roughly seven days, crosses the blood–brain barrier (BBB) during *C. sativa* exposure, reaches peak concentration within a few minutes of exposure, and takes about 30 days to be removed from the user's body system (Calapai *et al.,* 2020).

Euphoria, humor, anxiety, and relaxation are the effects of *C. sativa* exposure; however, as the dosage grows, hallucinations, paranoia, and disorientation quickly replace these effects. Extreme consequences like hemorrhagic stroke and cannabis-related illnesses are brought on by exposure to *C. sativa* at very high dosages (Wolf *et al.,* 2013). Increased dopamine synthesis is another toxicological mechanism used by *C. sativa.* This mechanism suppresses acetylcholine secretion, which in turn reduces glutamatergic synaptic transmission and causes abnormalities in brain function

(Bloomfeld *et al.,* 2016).

Furthermore, prental exposure to *C. sativa* impairs vision and dexterity, increasing the likelihood of producing children prone to aberrant behavior (Archie and Cucullo, 2019). Early-life exposure to *C. sativa* has been linked to poor working memory, cognitive function, personality, and educational results (Maldonado and Torrens, 2020; Prini *et al.,* 2020). Intelligence quotient and task execution (Pope *et al.,* 2003). Organizing tasks (Fontes *et al.,* 2011). According to Tervo-Clemmens *et al.*, (2018), visual attention and enhanced blood oxygenation level dependent (BOLD) activity at the front oparietal areas occur in adulthood.

Datura stramonium

The plant is most likely from Central America, according to certain theories. It was brought to Nigeria and is one of the most common weeds in the world, according to FAO and WHO 2020. It is one of the oldest and most often abused psychotropic plants, according to Dumbili *et al.,* (2020). The plant's genus name, *Datura*, was derived from the Hindi word Dhatr in 1662, and its English species name, Jamestown Weed, was then modified to Jimson (Fasakin *et al.,* 2021). Preissel and Hans-George (2002) claim that it was originally used to keep the ingredients needed to make love potions and witches' brew. In order to sedate their victims and cause anterograde amnesia, armed robbers have traditionally mixed *D. stramonium* with *Nicotiana tabacum* and given it to them by force (Fasakin *et al.,* 2021).

D. stramonium has been used recreationally in Nigeria, according to data showing a prevalence of 3.8–40.1% among respondents (Adegoke and Alo, 2013; Adesanya *et al.,* 2020). Its numerous occurrences as food contaminants, rather than its extensive recreational use, are the primary cause of most serious intoxications and fatalities (Ekanem *et al.,* 2016b). According to folklore, *D. stramonium* leaves and seeds are usually steeped in wine for several hours or days before being drunk. Its application also increases the potency of intoxication from most alcoholic beverages (Ekanem *et al.,* 2016a). The Fulani tribe in Nigeria uses it to prepare the porridge served during the public stroke lashing of suitors, known as Sharo/Shadi, which occurs during wedding ceremonies (Abdu *et al.,* 2020). The Fulfulde tribe of Nigeria also used a *D. stramonium* brew to boost young men's bravery and pain tolerance to fighting. As a kind of amusement, some have suggested smoking or chewing the seeds and leaves (Fasakin *et al.,* 2021). Nigeria permits its cultivation and trading, but other countries forbid it (Preissel and HansGeorge, 2002).

Toxicity

Datura stramonium has the highest tropane alkaloid production level in all the Solanaceae family, with scopolamine, atropine, and anisodamine being the primary tropane alkaloids found in the plant that inhibit neurotransmitters. *D. stramonium* is one of only a few psychoactive chemicals that have been linked to serious adverse recreational experiences, such as comas and death. The plant's ability to delay gastric absorption and to empty by inhibiting gastric motility via its anti-cholinergic effect increases the transit time of the plant in the victim's gastrointestinal tract, extending the duration of toxidromes. This causes symptoms of severe toxicity to appear 30 to 60 minutes after ingestion and may persist

for days (Kuete, 2014; Adesanya *et al.,* 2020). Youngsters and adolescents are particularly vulnerable to *D. stramonium* toxicity, with even very little dosages having significant effects on the central and peripheral nervous systems (Rakotomavo *et al.,* 2014). Even though there aren't many deaths linked to *D. stramonium* exposure, eating roughly 125 seeds has been known to result in cardiac failure (Khaw *et al.,* 2020).

Nicotiana tabacum (Tobacco)

Although it originated in 6000 BC, it was introduced to Nigeria in 1904 (Klein and Resnick, 2021). In Nigeria, people go by the names Taba (Yoruba), Utaba (Igbo), and Taba (Hausa) locally. Over 6 million people die each year from the use of *N. tabacum,* and if its widespread use continues, that number is expected to increase to over 8 million in 2030 (Okunna, 2018). Nigeria is one of Africa's biggest markets for *N. tabacum*, with over 18 billion cigarettes sold annually. The Framework Convention on Tobacco Control (FCTC) of 2005 and the National Tobacco Act of 2015 are still only dreams in the country, as evidenced by the approximately 931 million US dollars spent on tobacco-related items each year (WHO 2015; Ayodapo and Ibisola 2021).

According to Tiwari *et al.,* (2020), it is a psychotropic plant that is freely available worldwide. Statistics show that 55.3% of current smokers light up their first cigarette within 30 minutes of waking up and smoke 10 cigarettes on average each day, which totaled 40 billion cigarettes in 2015 alone and 110 million cigarettes daily (Aliyu *et al.,* 2016). In Nigeria, the percentage of adults who smoke cigarettes every day varied from 1.2% in Yaba, Lagos state, to 55.5% in Amassoma, Delta state, according to Dania

et al., (2015) and Owonaro and Eniojukan (2015). In contrast to the projected 4% of adult Nigerians who were active tobacco users in 2012, a 2019 survey found that the average prevalence of active tobacco use among adult Nigerians was 8.8% (Adeniji *et al.,* 2016).

The North-east (32.1%), South-South (13.1%), North central (10.3%), Southwest (8.9%), South-east (8.6%), and North-West (5.4%) regions had the highest prevalence of tobacco smoking, according to data from Aliyu *et al.,* (2016). North-central had the greatest proportion of tobacco product consumers at 5.2%, which contrasts with this data (Khaw *et al.,* 2020). However, just 1.5% of Nigerian adults frequently used smokeless tobacco, with the largest percentage residing in the 45–64 age range (Fasakin *et al.,* 2021). *N. tabacum* can also be taken with *D. stramonium* to enhance its entheogenic effects (Khaw *et al.,* 2020). Other methods of tobacco consumption include chewing (fresh leaves, chewing gum), inhaling, dipping, and drinking.

Toxicity

The main poisonous alkaloids of this psychotropic plant are nicotine and anabasine, which at certain dosages can be fatal to humans. According to Swan and Lessov-Schlaggar (2007), smoking *N. tabacum* has been identified as the single main cause of harmful chemical exposure in humans, and the World Health Organization predicts that this exposure will cause approximately nine (9) million deaths worldwide by 2030 (Mathers and Loncar, 2006). Notably, in an in vitro research, *N. tabacum* smoke extracts were found to be almost ten times more potent in causing neurotoxicity than its alkaloid, nicotine

(Slotkin *et al.,* 2014).

Proving that additional components of *N. tabacum,* like anabasine and polycyclic aromatic compounds, might contribute to its neurotoxicity. The aforementioned *N. tabacum* smoke extract differs from ordinary tobacco smoke in that it is devoid of carbon monoxide and hydrogen cyanide (Slotkin *et al.,* 2014). It's interesting to note that benzo(a)pyrene, a component of *N. tabacum* smoke extracts, demonstrated a synergistic effect on the central nervous system when delivered in combination with nicotine (Slotkin *et al.,* 2014), supporting the extracts' potency when compared to nicotine alone. Additionally, nicotine raises the numbers of nAChRs (nicotinic acetylcholine receptors), but *N. tabacum* smoke extracts decrease them. This has a variety of effects, including making presynaptic shortage more severe and making up for the loss of presynaptic participation. Addiction to *N. tabacum* has also been more common in those with mental illnesses (such as schizophrenia) than in healthy people (Fasakin *et al.,* 2021).

Carica papaya

Historical accounts indicate that *C. papaya* was first introduced to Africa in the sixteenth century, having originated in Southern Mexico and Central America (Khaw *et al.,* 2020). In Nigerian languages, it is known by the local names Ibepe (Yoruba), Okwuru-Ezi (Igbo), and Gwanda (Hausa). Papain, cafeic acid, -tocopherol, benzyl isothiocyanate, kaempferol, rutin, quercetin, and myricetin are among the chemical components of the plant that combine to treat a number of illnesses, such as cancer, inflammation, depression, aging skin, and a number of other chronic diseases

(Kong *et al.,* 2021). Nigerians are increasingly utilizing *C. papaya* (pawpaw) leaves recreationally as a psychoactive narcotic despite their medical virtues, which is having a detrimental effect on the nation's economy and health (Fasakin *et al.,* 2022). Although the plant has both male (flowering) and female (fruity) species, the male has historically been selected for recreational use above the female in folklore (Fasakin *et al.,* 2021). In folklore, the leaves are usually dried and smoked, and because their usage and cultivation do not violate any laws, recreational users have substituted them for *Cannabis sativa* (Aliyu *et al.,* 2016). In the meantime, individuals receiving treatment for *C. sativa* dependence often sneak out of psychiatric hospitals to smoke dried *C. papaya* leaves (Olley 2007). In a study on the prevalence of substance use among Lagos State University undergraduate students, up to 31.6% of participants said they used *C. papaya* leaves as a psychoactive substance (Fasakin *et al.,* 2021).

According to a different study specifically designed for the University of Ibadan, 65.6% of participants knew that *C. papaya* is a psychoactive substance, and 44.8% of respondents acknowledged using it in their lives. Olley (2007) reports that 43.4% and 32.4% of participants, respectively, affirm that recreational use of *C. papaya* leaves produces psychoactive effects comparable to those of cannabis sativa and cocaine/heroin. Furthermore, 9.3% of teens in North-Central Nigeria used *C. papaya* leaves recreationally as a psychoactive stimulant, according to a study (Aliyu *et al.,* 2016). The main macrocyclic lactone alkaloid of *C. papaya* leaf, carpaine, was found to form hydrogen bonds and hydrophilic interactions

with the interface of choline (both acetyl and butyryl-) acyl pocket domains and binding site. Trp 82 of the choline formed a hydrophobic interaction with carpain lactone (2.5 Å), while Val 288 of the acyl pocket formed a hydrogen bond with the carpain carbonyl group (3.3 and 4.6 Å) (Khaw *et al.,* 2020). Cholinesterase activity was found to be inhibited by this method (Khaw *et al.,* 2020). Additionally, Voacangine and Undulatin were found to be strong cholinesterase inhibitors by Aliyu *et al.,* (2016).

Consequently, cholinesterase will be over-inhibited at greater exposure levels, as noted by Fasakin *et al.,* (2021), which would result in excessive choline accumulation in the synaptic cleft and, ultimately, neurodegeneration. It has also been demonstrated that smoking *C. papaya* can lead to a lesion which can lead to hippocampal impairment. This suggests that the malfunction seen may be caused by the increased lipid peroxidation that Fasakin *et al.,* (2021) found in the brains of experimental mice treated to alkaloid extracts of *C. papaya* ex vivo. Furthermore, exposure to the plant's alkaloids has been linked to the development of necrosis by inducing the nucleus of brain cells' perinuclear space to increase (Oyewole and Owoyele 2014).

The study also found that the hippocampal cells became less active and reduced their rate of producing neurotransmitters after being exposed to *C. papaya* leaves. Additionally, vacuolations, disturbance of the magnocellular layer, and reduction of Nissl substances were noted when *C. papaya* leaves were exposed to smoke. These findings are further supported by research b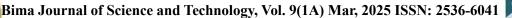y Bonini *et al.,* (2018), which found that exposure to smoked *C. papaya* leaves changed long-term spatial memory and anxiolytic effects, ultimately leading to alterations in the morphology of the experimental animals' hippocampal regions. According to the studies, smoking *C. papaya* leaves may reduce neuron activity and slow down the rate at which they produce neurotransmitters. This suggests that the precise mechanism of action will be mediated by consuming large amounts of *C. papaya* leaves. There is a growing collection of literature on the topic, and research into the use of psychoactive plants in Nigeria is still underway. While some research has looked at the pharmacological characteristics of these plants, other studies have looked at their cultural importance and usage patterns. All things considered, additional research is required to fully understand the use of psychoactive plants in Nigeria, especially in light of their possible health repercussions.

CONCLUSION

In Nigerian traditional medicine, the use of poisonous, narcotic, and psychotic herbs is a complicated and potentially hazardous matter. Even though some of these plants have therapeutic qualities, abusing them might have detrimental effects on one's health. However, when considering a plant's therapeutic usage, it's crucial to speak with trained medical specialists who can offer advice on how to utilize it safely and effectively.

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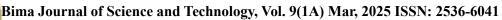
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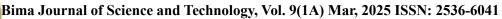
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