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Alternative treatment strategies for neuropathic pain: Role of Indian medicinal plants and compounds of plant origin–A review



Hasandeep Singh^a, Sakshi Bhushan^b, Rohit Arora^b, Harpal Singh Buttar^c, Saroj Arora^b, Balbir Singh^{a,*}

^a Department of Pharmaceutical Sciences, Guru Nanak Dev University, Amritsar, 143005, India

^b Department of Botanical and Environmental Sciences, Guru Nanak Dev University, Amritsar, 143005, India

^c Department of Pathology and Laboratory Medicine, Faculty of Medicine, Reproduction and Urology division, Therapeutic products Directorate, Health, Canada

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ABSTRACT

Neuropathic pain is a complex, chronic pain state accompanied by tissue injury and nerve damage. This important health issue constitutes a challenge for the modern medicine worldwide. The management of neuropathic pain remains a major clinical challenge, pertaining to an inadequate understanding of pathophysiological mechanisms of neuropathic pain. Various classes of drugs have been reported effective for the management of neuropathic pain viz. opiates, tricyclic antidepressants, and antiepileptic agents. However, association of adverse effects with these drugs hinders their confident prescription in people with neuropathic pain. Recently, various medicinal plants have been reported effective for the management of neuropathic pain. So, it may be prudent to look beyond synthetic drugs pertaining to their unprecedented pharmacotherapeutic effects with lesser adverse effects. The extensive literature review has been carried out from databases such as Science direct, Scifinder, Wiley online library, PubMed, Research gate, Google scholar and Chemical Abstracts. The list of Traditional Indian Medicinal plants (TIMPs) and isolated compounds have been compiled which have been reported effective as an alternative therapy for the management of neuropathic pain. This helps the researchers to discover some novel therapeutic agents against neuropathic pain.

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Abbreviations: BCP, beta caryophyllene; CCI, chronic constriction injury; CFA, complete Freund's adjuvant; CNS, central nervous system; GPCR, G protein-coupled receptor; GRAS, generally recognized as safe; IL-16, interleukin- 16; IL-17R, interleukin- 17R; IL-22, interleukin-22; MGL, monoacylglycerol lipase; NF- κ B1, nuclear factor kappa; NP's, natural products; PAT, porocessed *Aconiti tuber*; PGE₂, prostaglandin E₂; PNS, peripheral nervous system; PSLN, partial sciatic nerve ligation; SJW, St. John's Wort; US FDA, US food and drug administration.

* Corresponding author.

E-mail address: balbir_gndu@yahoo.com (B. Singh).

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1. Introduction

Chronic pain is a public health problem that causes personal and social afflictions and this important health issue constitutes a challenge for the modern medicine worldwide [1]. Depending upon its origin, chronic pain can be classified as inflammatory and neuropathic modality. Neuropathic pain is generally characterized by the sensory abnormalities such as unpleasant abnormal sensation (dysesthesia), an increased response to painful stimuli (hyperalgesia), and pain in response to a stimulus that does not normally provoke pain (allodynia) [2]. Neuropathic pain is a debilitating condition that can arise from a disease or injury to the central nervous system (CNS) and the peripheral nervous system (PNS). Persons suffering from chronic condition may not be able to engage in daily activities. Neuropathic pain is often distinguished

from the other painful conditions, since the pain generator lies in non-neural diseased tissues. These non-neuropathic pain entities are said to be nociceptive and include conditions such as osteoarthritis and inflammatory pain like multiple sclerosis, diabetic neuropathy, stroke, trauma, and cancer. Furthermore, neuropathic pain occurs frequently in cancer as a direct result of peripheral nerve damage (e.g., compression by a tumor) or as a side effect of many chemotherapeutic drugs [3–5]. Up to 7% to 8% of the European population is affected, and in 5% of persons it may be severe.

1.1. Mechanisms of neuropathic pain

In last few years, numerous mechanisms perpetuating neuropathic pain have been elucidated. In nociceptive and neuropathic

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