Chapter 11
Cognitive Enhancement and Neuroprotective Abilities of Plants:
Ethnobotanical and Pharmacological Importance of These Plants

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ABSTRACT

Extensive research suggests that a number of plant-derived chemicals and traditional Oriental herbal remedies possess cognition-enhancing properties. Widely used current treatments for dementia include extracts of Ginkgo biloba and several alkaloidal, and therefore toxic, plant-derived cholinergic agents. Several non-toxic, European herbal species have pan-cultural traditions as treatments for cognitive deficits, including those associated with aging. Acute administration has also been found to reliably improve mnemonic performance in healthy young and elderly cohorts, whilst a chronic regime has been shown to attenuate cognitive declines in sufferers from Alzheimer's disease. The present chapter looks at the ethnobotanical and pharmacological importance of various plants cognitive enhancing and other neuroprotective abilities.

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INTRODUCTION

Gradual loss of function or structure of the nerve cells lead to the neurodegenerative disorders such as Parkinson disease, Alzheimer disease and Huntington's disease, multiple scleroses etc. According to World Health Organization (WHO), the second principal cause of death will be neurodegenerative diseases by the year 2040 (Tejada *et al*., 2017). Recently immense focused has been placed on understanding the mechanism of death of nerve cells. Neurotic injuries are associated with the series of neural toxic agents including inflammatory cytokines, mitochondrial malfunctioned, oxidative stress and irregular protein activities (Ansari & Khodagholi, 2013; Chen *et al.,* 2016; Hirsch & Hunot, 2009). One of the leading reasons behind neuron death is reactive oxygen species (ROS) that induced oxidative harm to protein, lipids and DNA followed by persuading oxidative strain. Besides this oxidative stress is predominantly associated with death of secondary cells in various central nervous system ailments (Jalsrai *et al.,* 2016; Sultana & Butterfield, 2010). Recent analysis has shown that neuron death is occurred by apoptosis. There are two major signaling pathways that participated in the apoptotic cell death; mitochondrial pathway (intrinsic) and death of receptors (extrinsic) (Elmore, 2007). Different transcription factors are involved in neuron protection, such as cAMP-response element binding protein, nuclear factor erythroid-derived 2, nuclear-factor-kappa-B etc. These transcriptional agents are primarily linked with regulation of various genes that modulate the inflammatory action and activation of antioxidant enzyme (Ansari *et al.,* 2011; Ashabi *et al.,* 2012). Additionally, transcription factors are because of their functions in growth of nerve cells, synaptic plasticity, axonogenesis, and neuronal homeostasis (Freese *et al.,*2010). In this context, neuroprotective elements appeared as a shielding agent to secure CNS against disorders associated to neuron (Pak *et al.,* 2016). Various synthetic drugs are present for neurodegenerative disorders like acetylcholinesterase blockers, neuroleptic drugs, dopamine therapy, brain stimulation, antipsychotic drugs (Mizuno, 2014) non-steroidal anti-inflammatory drugs and riluzole etc. (Chen & Pan, 2014). These drugs are useful against several neurodegenerative diseases but possess severe side-effects in longer run. Additionally, the present medication only treats the patient symptomatically. Thereby, to cope with the problem of neurodegenerative ailments, multifunctional, secure and extremely efficacious drugs must be developed. For the last few decades, significant amount of research has done on development of drugs for neurodegenerative diseases from the natural products particularly plants. The phytochemicals obtained from the plants have exhibited remarkable cognitive enhancement and neuroprotective abilities (Crane, 2009; Desai & Grossberg, 2005). In this chapter, pharmaceutical and ethnobotanical significance of plants with cognition functioning and other neuroprotective potentials have been described.

Bacopa Monniera (Linn.) Pennell (Plantaqinaceae)

B. monniera is native to India and has been utilized for the treatment of several diseases involving stress, memory loss and intellect. It generally consists of saponins and alkaloids. The major active components regarding the enhancement of cognitive abilities are saponins bacoside A and B. In rats, B. monniera considerably improves the memory, and hindered the amnesic effects caused by electric shock, immobilization stress and scopolamine. Additionally, B. monnieri has been found to improve protein kinase action in the hippocampus region, which could also contribute to its nootropic action. Simultaneously administration of brahmi and phenytoin for 15 days delays the phenytoin stimulated disabilityin rats. For 15 days, internal intakes of B. monniera product lead to enhance acetylcholine along with the reduction in activity of choline acetylase. The administration of the herb also reduced the colchicine induced