

## Dementia 2018: Food for the brain: Tropical vegetables and spices with neuroprotective properties

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Neurodegenerative diseases are generally characterized by memory loss, cognitive dysfunction, neuronal damage and death. The pathogenesis of neurodegenerative diseases such as Alzheimer's Disease (AD) and Parkinson's Disease (PD) are not well understood. However, these diseases are multifactorial etiology, which involves complex mechanisms such as disruption of neurological cascades, oxidative stress, impaired neurochemistry, protein misfolding and aggregation as well as deposition of senile plaques and insoluble fibrils in the brain. Management of age-related diseases including AD and PD have been associated with consumption of functional foods which could be whole, fortified, enriched or enhanced foods that provides health benefits beyond the provision of essential nutrients. These foods contain phytochemicals such as polyphenols, alkaloids, carotenoids, anthocyanin's and many more which are capable of improving cognitive function, learning, general brain and wellbeing. Tropical vegetables and spices are among one of the most consumed food either singly or as part of other dishes. In our lab, we have employed various experimental models including in vitro screenings, in vivo studies in rats and fruit fly (*Drosophila melanogaster*) to study the biochemical and molecular basis of neuroprotective properties of several tropical vegetables and spices. This review major findings from our lab on the neuroprotective properties (as well as the underlying biochemical and molecular mechanisms) of some tropical vegetables and spices in various experimental models. Experimental findings on tropical green leafy vegetables including Amaranth (*Amarantus cruentus*), Water bitter leaf (*Struchium sparganophora*), Pumpkin (*Telfairia occidentalis*), Horseradish (*Moringa olifera*), African Jointfir (*Gnetum africanum*) and spices such as pepper varieties (*Capsicum* spp.), Ginger (*Zingiber officinale* Roscoe), Turmeric (*Curcuma longa*), Alligator pepper (*Aframomum melegueta*), and Bastard Melegueta (*Aframomum danieli*) were presented. Furthermore, characterized phytochemicals especially polyphenols and alkaloids from these tropical foods is also elucidated. It is believed that our findings would provide useful information on the neuroprotective properties of these functional foods which could form basis for their adoption as functional foods and nutraceuticals for the management of related neurodegenerative disease.

Neuroprotection refers to the strategies and relative mechanisms able to defend the central nervous system (CNS) against neuronal injury due to both acute (e.g. stroke or trauma) and chronic neurodegenerative disorders (e.g. Alzheimer's disease, AD, and Parkinson's disease, PD). Among these strategies, herbal medicine may represent a valuable resource in prevention rather than in therapy of some CNS diseases, in association with a healthy lifestyle including correct dietary habits and moderate physical activity. As complementary and alternative therapy, herbal medicine, or simply phytotherapy, refers to the medical use of plant organs (leaves, stems, roots, flowers, fruits and seeds) for their curative properties. Generally, herbal products contain complex mixtures of active components (phytochemicals), including phenylpropanoids, isoprenoids and alkaloids, and it is often difficult to determine which component(s) of the herb(s) has biological activity.

Nutritional therapy is a healing system using functional foods and

nutraceuticals as therapeutics. This complementary therapy is based on the assumption that food is not only a source of nutrients and energy, but can also provide health benefits. In particular, the reported health-promoting effects of plant foods and beverages can be ascribed to the numerous bioactive chemicals present in plant tissues and, consequently, occurring in foods. Consumed as part of a normal diet, plant foods are thus not only a source of nutrients and energy, but may additionally provide health benefits beyond basic nutritional functions, by virtue of their dietary therapeutics (phytochemicals).

In this survey, we briefly introduce neurodegenerative diseases, AD and PD in particular, with emphasis on the preventive strategies represented by herbal medicine and nutritional therapy. We provide an ethnobiological approach, focusing on plant foods and medicinal herbs used by different traditional medicines and diets and relevant for some of their neuroprotective components.

Traditional Chinese Medicine (TCM) is one of the world's oldest documented medical systems based on herbal medicines. It has been estimated that about 20% of the plant species listed in *Flora Sinica* are used as medicaments. Typical TCM concepts are Yin, Yang and Qi, components of 'vital energy' difficult to translate into Western medical terms. Unlike the concept adopted in Western medicine, 'vital energy' in TCM is a term for collectively describing both the mental and physical energy. It is believed to be essential for growth, daily activities, reproduction, cognitive functions and unbalance of Yin and Yang breaks body's harmony predisposing to diseases. To restore this harmony is the principle for treating illnesses. In Chinese tradition, ageing is considered a progressive decline of vital energy in our body, and anti-ageing herbs are able to correct the imbalance of vital energy components. In the ancient TCM book 'Yellow Emperor's Canon of Internal Medicine', appropriate lifestyles are described to preserve vital energy in our body, such as optimal diet, moderate exercise and reduction of both mental and physical stress, able to increase lifespan beyond 100 years of age. According to the tradition, the Yellow Emperor established herbal medicine about 5,500 years ago, assaying hundreds of plants to discover medicinal herbs. Despite the completely different basic philosophical principles, the ancient, but still vital, TCM has represented a therapeutic wisdom for Western medicine in recent years, as in case of anti-ageing herbs.