

Therapeutic potentials of plant secondary metabolites for future contribution

Mamta Kumari^{1*} and Jagdeep Singh²

¹Junagadh Agricultural University, India

²PAHER, India

Herbal medicines are one of the important cultural and traditional parts of the people. Today, most of the world population depends on herbal medicines for their health care needs. The biochemistry of medicines based on traditional natural products has made a tremendous contribution to public healthcare and has boosted the development of affordable medicines globally. Natural products are a potential supply for novel biologically active compounds that could lead to the innovation of new therapeutics. Hence, nature is the exclusive and ultimate source of all such drugs. From a drug discovery perspective, plant chemical molecules will hit the drug target at specific sites and rule over the synthetic compound. Significantly, natural products and their derivatives contribute to more than half of the Food and Drug Administration (FDA) approved drugs. Thus, plant chemical constituents are one of the richest hot spots for most significant new drug discoveries.

Plants produce a large and diverse array of organic compounds that appear to have no direct functions in growth and development. They are often produced in response to environmental stresses caused by diseases, insects, climate, ultraviolet radiation, etc. Secondary metabolites are the heterogeneous group of naturally occurring compounds, which have been used to treat various diseases and have a scientifically proven effect on health. The greater part of plant derived compounds are phytochemicals, and secondary metabolites, which play a dominant role as antimicrobials and antivirals and are classified in many groups such as, alkaloids, phenolics, polyphenols, flavonoids, quinones, tannins, coumarins, terpenes, lectins and polypeptides, saponins, etc. Additionally, plant products have the ability to modify or inhibit protein-protein interactions, thus presenting themselves as effective modulators of immune response, mitosis, apoptosis, and signal transduction. Bacteria are unable to develop resistance to multiple chemically complex phytochemicals present in plant extracts. The use of traditional medicines clearly depicts how biologically potential active compounds can kill the pathogens and can stop further advance of the disease. In fact, secondary metabolites, used as a single compound or as a mixture, are medicines that can be effective and safe even when synthetic drugs fail. They may even potentiate or synergize the effects of other compounds in the medicine.

A diet which is rich in plant foods contains a variety of secondary metabolites and contributes to protecting the body against cancer, cardiovascular illnesses and other degenerative diseases. Polyphenols are one of the most important classes of

phytochemicals from the nutritional point of view as they exhibit highest amount of antioxidant property among others. However recent data indicate that the protective effect of flavonoids, wine and cocoa products may have positive effects on human health. The phenolic compounds that are commonly found in fruits and vegetables are described as cardioprotective, antigenotoxic, anti-inflammatory and anticarcinogenic agents. These phenolic compounds are not found in a free state in plants for e.g. phenolic acids are usually found esterified to sugars, organic acids and lipids (except those found in trace) because they are accumulated in vacuoles or linked to cell wall components. Therefore, there are several metabolic processes (related to such pathologies as obesity, insulin resistance and diabetes) that are targets for the effects of these phenolic compounds. These processes include the modulation of glucose and cholesterol metabolism, and changes in the lipid plasma profile. In summary, phenolic compounds have been reported to (a) modulate intracellular signalling through PI3K and p38 MAPK pathways; (b) modulating the activity of target enzymes (e.g. nitric oxide synthase); and (c) modulating gene expression. The metabolization of most phenolic compounds occurs intracellularly either in the small intestine or in the liver. In the enterocytes and hepatocytes, polyphenols and their derivatives may undergo reactions such as hydroxylations, methylations, and conjugation with glucuronic acid and/or sulfate. Some in vitro studies have shown that glucuronidation can increase or decrease the biological activity of individual polyphenols. Therefore these specific phytochemicals provide a promising area of research for future human studies and potential utility for disease prevention and treatment. Conversely some researches stressed on dietary bioactive compounds from different functional foods, herbs and nutraceuticals (ginseng, ginkgo, nuts, grains, tomato, soy phytoestrogens, curcumin, melatonin, polyphenols, antioxidant vitamins, carnitine, carnosine, ubiquinone, etc.) that can ameliorate or even prevent diseases. Protection from chronic diseases of aging involves antioxidant activities, mitochondrial stabilizing functions, metal chelating activities, inhibition of apoptosis of vital cells, and induction of cancer cell apoptosis.

Functional foods and nutraceuticals constitute a great promise to improve health and prevent aging-related chronic diseases. It is increasingly being realized that proper diet can provide requisite amount of nutraceutical components, thus decreasing the dependence on synthetic supplements. The potency of herbal drugs is significant and they have negligible side effects

than the synthetic antidiabetic drugs. There is increasing demand by patients to use the natural products with antidiabetic activity. In recent times there has been renewed interest in the plant remedies. Plants hold definite promises in the management of Diabetes mellitus. Isolation and identification of active constituents from these plants, preparation of standardized dose & dosage regimen can play a significant role in improving the hypoglycaemic action. Herbal supplements for diabetes can be part of a treatment that focuses on nutrition, exercise and monitoring blood glucose levels.

Nutraceuticals are destined to play an important role in future therapeutic developments but their success will be governed by control of purity, safety and efficacy without inhibiting innovation.

Nutraceuticals will continue to appeal because they are convenient for today's lifestyle. Some are also genuinely researched and offer novel ingredients that can bring about health benefits quicker than would normally be the case through eating conventionally healthy foods alone. Public health authorities consider prevention and treatment with nutraceuticals as a powerful instrument in maintaining health and to act against nutritionally induced acute and chronic diseases, thereby promoting optimal health, longevity and quality of life. A place for nutraceuticals in clinical practice is emerging, but important pharmaceutical and clinical issues need to be addressed by future research