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Editorial

Enhancement of bioactive compound production, antimicrobial activity and evaluation in animal models

Since the beginning of human civilization, medicinal plants have been used by mankind for its therapeutic value. According to the World Health Organization (WHO) in 2008, more than 80% of the world's population relied on traditional medicine for their primary healthcare needs. Medicinal plants produce bioactive compounds used mainly for medicinal purposes. These compounds either act on different systems of animals including man, and/or act through interfering in the metabolism of microbes infecting tem. The microbes may be pathogenic or symbiotic. In either way the bioactive compounds from medicinal plants play a determining role in regulating host-microbe interaction in favour of the host. So the identification of bioactive compound in plants, their isolation, purification and characterization of active ingredients in crude extracts by various analytical methods is important.

In this issue of JMPR Lu et al. analysed compounds of *Purslane* (*Portulaca oleracea L.*) (Chinese name Ma-Chi-Xian) extracts. It is used in China as an edible plant and as a traditional Chinese herbal medicine for alleviating pain and swelling, antimicrobial, antidiabetes and enhancing immunity (Yang et al., 2007). There seems to have little research on the effects of anti-kinetic fatigue, and the analysis of compounds of *Purslane* extracts (PE). So the authors did thin layer chromatography (TLC) and showed the presence of organic acid, flavonoids, alkaloids, monoterpene glycoside, catecholamine, saponin and polysaccharide. The *Purslane* extract had significant anti-kinetic fatigue effects on mice, evaluated by forced swimming exercise of male mice, by increasing fat utilization, and by delaying the accumulation of plasma lactate and ammonia. Although the paper deals with 2 different aspects, the analysis of the active ingredients responsible for anti-kinetic fatigue effect is yet to be characterized and isolated.

Most of these compounds in plants are derived through several inter-acting metabolic pathways, preferably through secondary metabolic pathways. As the production of such bioactive compounds depend on both primary processes such as photosynthesis and respiration for basic carbon compounds to be further utilized in secondary metabolic pathways, the regulation of bioactive compounds by external and indogenous factors are essential for medicinal plant improvement. Odabas et al. (2009) studied *Hypericum perforatum* L. - a perennial medicinal plant known as “St. John’s wort” in Western Europe (Sanchez-Mateo et al., 2002). Crude extract of *H. perforatum* is widely used as antidepressant in Europe. It has photodynamic, antiviral, antiretroviral, and antitumoral activities as well has potential use in AIDS and cancer treatments (Guedes and Eriksson, 2005). Hyperforin and hypericins are the main ingredients responsible for antidepressant, anti-inflammatory, antitumoral and antiangiogenic effects, and the naturally occurring red pigments hypericin and pseudoyhpericin have photodynamic, antiviral, antiretroviral, antibacterial, antipsoriatic, antidepressant and antitumoral activities. In the present study the authors did a quantitative analysis of hyperforin, hypericin and pseudohypericin by HPLC, and reported a sequntial increase in the quantity of these compounds with an increase in temperature from 24^{o}C to 32^{o}C and with light intensity from 803.4 - 1618.6 µmol $m^{-2}s^{-1}$ in greenhouse grown *H. perforatum*. Misra (1995a, b) reported the effect of light intensity on metabolites and aromatic oil yield of patchouli (*Pogostemon cablin* Benth). These results clearly show that environmental factors play a vital role in increasing the metabolite production in medicinal plants.

Besides China and Europe, Arabs are the largest user of hebal medicines. *Commiphora molmol* Engl. ex Tschirch (locally known as Myrrah) such as treating wounds, intestinal parasites, diarrhea, cough and chest aliments, anti-parasitic, in treating gingivitis, antimicrobial and anti-inflammatory. *B. papyrifera* (locally known as Luban-murr or Khandar) have applications in traditional medicine for treating cough, anti-inflammatory and anti-arthritic disorders, antivaginal infections, antibacterial, in activating blood circulation and relieving pain. Resins from these two plants are used in suspension form in the traditional and folk medicine. Abdallah et al. (in this issue) studied the the potential hazards and toxicity of the resins from these two medicinal plants on rats. Long term use of the resins at high dose @5000 mge /kg body weight of rat could cause deleterious toxicological symptoms, although low doses have no toxicity effect.

Abubakar (2009) studied the potential medicinal use of *Euphorbia hirta* Linn. (Family Euphorbiaceae local names include *nonon furchiya* in Hausa, *tepel* in fulzfulde, *Harvom* in Kaka and Hammock sand mat (Florida).) grows in waste land in the tropics. The medicinal properties of the herb are well known as antispasmodic, antiasthmatic, expectorant, anti-catarrhal and antisyphilitic. The active ingredients are reported to be choline, shikimic acid and the quercetin (Bala, 2006). Commonly called asthma weed in Asia and Australiaand used to cure asthma, coughs, diarrhea and dysentery. In east, central and west Africa, a decoction of the herb is used to treat asthma, oral thrusth, boils, sores, skin and wound infections, in addition to its been used as an antispasmodic, antipruritic, carminative, depurative, diuretic, febrifuge, galactogogue, purgative and vermifuge. In Mauritius, a decoction of the plant is used to treat respiratory tract ailments. In Nigeria, exudates of the stem is used to treat eye and ear infections (Igoli et al., 2005), while a decoction of the plant is used to treat enteric infections including diarrhea and dysentery, constipations and other stomach problems, asthma, bronchitis, eczema, athletes foot and scorpion bite pains (Bala, 2006). Because of its wide usage and easy availability, Abubakar (2009) made a phytochemical screening of the crude extracts and reported the presence of tannins, saponins, phenolics, flavonoids, cardiac glycosides, anthroquinones and alkaloids. The presence of these bioactive comounds imparts its efficacy as a antimicrobial agentagainst *Escherichia coli*, *Klebsiella pneumoniae. Shigella dysentriae, Salmonella typhi* and *Proteus mirabilis.* This justifies the use of the herbs in traditional medicine. The antibacterial activity of the plant material is enhanced under acidic conditions and at elevated temperatures. The herb *E.* hirta can be used as source of oral drugs to fight bacterial infections.

The Philippines traditional medicine reported by Vital and Rivera1 (2009) on the antimicrobial activity and cytotoxicity of *Chromolaena odorata* (L. f.) King and Robinson and *Uncariaperrottetii* (A. Rich) Merr. A decoction of the leaf *C. odorata* (synonym: *Eupatorium odoratum* L.) (Asteraceae) is used as expectorant, and is an ingredient with lemon grass and guava leaves for the treatment of malaria. Other medicinal uses include anti-diarrheal, astringent, antispasmodic, antihypertensive, anti-inflammatory and diuretic. A decoction of flowers is used as tonic and antipyretic (Bunyapraphatsara and Chokechaijaroenporn, 2000). The second plant studied was *Uncaria perrottetii* (A. Rich) Merr. (Rubiaceae) and has potential antiinflammatory, contraceptive, immunostimulant and antioxidant properties (Ccahuana-Vasquez et al., 2006). In this issue Vital and Rivera1 (2009) reported that the ethanol extracts of leaves of *Chromolaena odorata* and ethyl acetate extracts of stem bark of *Uncaria perrottetii* have antimicrobial and cytotoxic properties. Phytochemical screening revealed the chemical composition of *C.odorata* extracts containing flavonoids, saponins, tannins and steroids, while *U. perrottetii* possessing alkaloids, tannins and leucoanthocyanin. Thus, these plant extracts can possibly be used to produce alternative forms of antimicrobials.

The studies on terrestrial and angiospermic medicinal plants are common. But the global area is filled up with more than 70% water bodies such as the seas and oceans. These areas are abundant with little explored aquatic flora and fauna, which have abundant bio-active and useful pharmaceutical products. *Oscillatoria willei* is a blue green algae. It occurs across the world in a range of terrestrial, fresh water and marine environment (Alonse et al., 2001). Cyanobacteria have a great potential as a source of food, fine chemicals, biofertilizer and renewable fuel (Monserrat et al., 2001). Cyanobacteria find wide use in agriculture, bioremediation, clinical diagnosis; pharmacological aspect etc. potentially useful compounds including pharmaceuticals, industrial chemicals, restriction enzymes etc. (Borowitzka, 1995). Among the many compounds found and characterized till date, many are toxic and have been suspected as the cause of deaths in animals including humans. Rajvel et al (2009) found out analgesic and anti-inflammatory compounds from *O. willei* methanolic extracts using standard mice and rat models, respectively.

These studies on medicinal properties of plants and plant extracts starting from aquatic cyanobacteria to xeromorphic Eucalyptus or plants from most evolved dicot family Asteraceae, and also from African continent circumnavigating to the USA, the importance of medicinal plants and their potential use in days to come is imperative and indispensable. The traditional medicinal drugs need thorough photochemical or bioactive ingredient analysis/ screening and classification for their diverse uses. A word of caution may be made for an in depth study for adverse and toxicity effects, without any bias that traditional medicine or medicinal plant extracts lack any adverse side effects or toxicity syndromes. Consorted efforts are needed to enhance the production of bioactive compounds and their use in medicine through the use of proper test models, within the framework of stipulatory ethical regulations.

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