

Review Article

VALIDATION AND THERAPEUTIC USE OF SUCCULENT PLANT PARTS - OPENING OF A NEW HORIZON OF ALTERNATIVE MEDICINE

Shibabrata Pattanayak ^{1*}, Tapan Kumar Mandal ², Susanta Kumar Bandyopadhyay ³

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ABSTRACT: The history of use of plants for medicinal purposes is very old. In the ancient civilizations, the crude plant parts were mostly used in such purposes. In the ongoing research, solvent extracted parts of the plants are validated for their reported efficacy with an intention to identify the active principles for production of those at a large scale to use them commercially as medicines. This contemporary method may be added with validation of reported medicinal plants at their fresh, succulent form with all the available principles within them. The validated medicinal plants may be used in many purposes after performing studies related with toxicity, dose etc. Organic animal farms may be created by using fresh inputs of the added medicinal plant garden, replacing the inorganic medicines. Commercialization of succulent medicinal plant part extracts may be performed by export oriented agro-medicine business with the assistance of different cooling systems.

Key words: Medicinal plant, Organic animal farm, Succulent extract, Agro - medicine business.

INTRODUCTION

Plants are used as a therapeutic mean since ancient time. According to the published reports, around 5000 species have specific therapeutic value out of 250000 higher plant species on earth (Joy *et al.*, 1998). India, a country of very ancient heritage of use of plants for restoration and protection of health, is having one of the world's leading biodiversity

centers with over 45,000 different plant species. It is having 16 different agro climatic zones, 10 vegetation zones, 25 biotic provenances and 426 biomass (Asthana *et al.*, 2012).

Over 6000 plants are estimated for their use in traditional, folklore and herbal medicine in India. The Indian system of medicine has identified almost 1500 medicinal plants of which 500 are commonly used (Agrawal and

¹Asst. Director, ARD (Microbiology), Institute of Animal Health & Veterinary Biologicals(R&T), 37, Belgachia Road, Kolkata -700037, West Bengal, India.

² Professor, Department of Veterinary Pharmacology & Toxicology, West Bengal University of Animal & Fishery Sciences, 37, Belgachia Road, Kolkata- 700037, West Bengal, India.

³ Director of Medical Education and Research, Government of West Bengal, Swastha Bhavan, Kolkata, West Bengal, India.

* Corresponding author. e - mail: pattanayak1966@gmail.com.

Tyagi 2015). According to reports of the World Health Organization, 80% of the world's population relies mainly on traditional therapies, which involve the use of plant extracts or their active substances (WHO 1993). Traditionally, ethnomedicines are extensively used in India and elsewhere due to their low cost, easy accessibility to everyone and perceived fewer side effects (Rathee *et al.*, 2006). Rural people, especially the ethnic communities of India, traditionally use the plant resources for their food, shelter and health care. Such knowledge, mostly oral, is passed on to generations and thus appears to be eroding owing to the gradual changes in the life style of these communities (Pattanayak *et al.*, 2012).

Various plant parts act as a part of modern medicines. According to some estimation, plant materials are present in, or have provided the models for 50% of Western Drugs (Robbers *et al.*, 1996). As a part of searching for new molecules for development of medicines, many phyto-pharmaceutical laboratories are now concentrating their efforts to identify the active constituents and models of action of various medicinal plants (Hwang *et al.*, 2000).

THE CONTEMPORARY STUDY FOR VALIDATION OF EFFICACY

Research for identification of active principles from medicinal plants follows some common steps. The validation of the reported medicinal use of plant is performed as a first and deciding step for further research. Generally, the reported plant parts were collected, dried and preserved for study. Most of the pharmacological reports of plant/plant extracts screen the organic soluble extracts of the dried plant (Kumar *et al.*, 2007).

Phytoconstituent extraction involves the separation of the medicinally active principles

from plant using selective solvents (Thakur *et al.*, 2011). Actually, the methanolic, ethanolic, acetonetic aqueous etc. extracts of the preserved plant parts were made and stored at different manner. Then these are tested for their reported medicinal use by some laboratory based *in vitro* tests and/or by some *in vivo* tests on animal models, either in that form or in semi-purified or purified form or after extraction of active principles. The plants, failed to pass that step are not regarded qualified for further study. Studies related with dosing, toxicity etc. are performed stage wise afterwards before using such molecule as medicine.

LIMITATION OF THE CONTEMPORARY STUDY

In almost all the ancient civilizations, plant parts were used as a whole. In many cases, the plant parts were used at its succulent stage, just after collection from the living plant. Generally, the ethnic and other rural people traditionally use the plants in its crude, succulent and fresh form in most of the time still today. It was argued that the concept of contemporary research have the limitation of loss of many aromatic and other phytochemicals present in the living plant, which may have very important role when used together (Pattanayak *et al.*, 2013). The solvent extracted part or the separated active principles may not show the total effect of the plant part, as many of the principles become lost during the whole process.

STUDY OF SUCCULENT PLANT PART EXTRACT

The succulent parts of the medicinal plants may be studied to overcome the limitation.

It can be better performed in the laboratories near the area of natural habitat of the plant. Cultivation of the plants in any artificial climate like the natural habitat of the plant may also be performed for that purpose. But the term 'crude extract' may not be used for the extracts of succulent plant parts as the term 'crude extract' is used for the solvent extracts of dry plant parts in some research papers (Ahameethunisa and Hopper 2010).

Some study reports are found where the succulent plant parts were able to show better performances than the aqueous or solvent extracted portion of the dried plant parts. In one such report, a reported wound healing plant *Berberia lupulina* Lindl. was evaluated for its antimicrobial activity. The extract of succulent leaves collected from living plant was studied along with conventional methanolic and aqueous extracts made from the dry leaves of the plant. The extracts were tested on three pathogenic bacteria and the antimicrobial activity was tested by disc diffusion method and also by Spectrophotometric method. The aqueous extract failed to show any anti-microbial effect and the succulent leaf extract showed better effect than methanolic extract against all the tested bacteria (Pattanayak *et al.*, 2014).

In one another study, the succulent leaf extract of another wound healing plant, *Mikania scandens* (L.) Willd. showed better antimicrobial activity against *Salmonella enteritidis* and *Escherichia coli* than methanolic extract, but showed lower activity against *Staphylococcus aureus* in disc diffusion and showed activity at 33% concentration against all the tested microorganisms in spectrophotometry. During *in vivo* wound healing study, the succulent leaf extract showed better wound healing potential than

methanolic extract on punch wound of rabbit (Pattanayak *et al.*, 2015a).

A novel type of *in vivo* study was performed for detection of time intervals required for haemostasis in rabbit. Ethnomedicinal report of haemostatic activity of six medicinal plants was validated by observing the effect of succulent leaf extract of plant parts on the punch wound of rabbit. It was found that the succulent leaf extracts of all the study plants are having effect to induce haemostasis in comparison to control. But the highest haemostatic power was showed by the latex collected from the small branches of living *Croton bonplandianum* plant, which was found better than the positive control of Tincture Ferric Per Chloride. In dermal toxicity study, application of all the fresh plant extracts failed to produce any detrimental effect on the skin of rat (Pattanayak *et al.*, 2015b).

The plants having report of medicinal use can be tested at their succulent form or at the nearest form of original reported use. This can be performed by adding some modifications in the existing analytical systems according to the requirement at case to case basis. One such extraction procedure was described by Pattanayak *et al* (2014) where ancient pastle-morter- cotton cloath filtration procedures were added with some simple modern techniques like centrifugation, storage at low temperatures etc.

Study of medicinal plants for common, familiar use as well as for non-familiar reported use may be performed. As many plants are traditionally used singly in some cases and in combination in some other cases, study on effectiveness and side effects of single and combinational use of parts of plants may be performed.

Standardization of dose schedule and study for probable toxicity are also some other

important issues. Standard protocols are available for such studies. Partial modification of such study procedures may be incorporated, if required.

SCOPE FOR THERAPEUTIC USE

The present day allopathic system of medicine suffers many obstacles in the way of achieving its target. Discovery and development of newer drugs to replace ineffective or less effective drugs is a continuous phenomenon in modern medicine. If we think about the field of antibiotics, the reasons of development of Superbugs can lead us to think about reconsideration of the present system of use of synthetic and semi-synthetic drugs and importance of development of other therapeutic means with some different mechanisms to act than the conventional drugs. Use of suitable plant derived medicines can be an answer of these problems.

Medicinally active succulent parts of the plants may be used in various purposes effectively if studied and planned properly. Two such uses are scheduled here.

A. Organic animal farm

Animals and birds are reared for milk, meat and egg production to meet up the demand for human consumption. Various modern medicines, which were developed for use in human, are also extensively used for production as well as treatment or prevention of diseases of animals. This present system acts as a source of development of many serious problems. If we analyze the reasons of development of resistance of bacteria against antibacterial substances, development of at least a part of such resistance is attributable to their indiscriminate use in the farm animals and birds (Pattanayak 2011). To overcome such

problems, a new concept of farming may be followed.

Present day farm animals are the successors of their free living ancestors. Domestication of animals was started thousands of years ago as documented in the signs of the ancient civilizations. As most of the modern farm animals are herbivorous, their body system is accustomed with utilization of nutrients available after digestion of plant materials. Concept of addition of animal proteins, minerals, growth promoters, pre and probiotics etc. in the feeds of farm animals is need based and performed for incurring less expenditure through feeding, breeding and management. As a part of management, we developed health care systems of the farm animals with the tools available in our hand for our use. In many cases that was not properly effective due to the physiological/systemic differences among man and different species of animals, but we adhered with our concept.

Sometimes we use these resources *ad libitum* among farm animals. Apart from the issue of huge financial involvement, the dangers behind this concept are appearing in last few years. Mad cow disease, gathering of toxic chemicals in our body from animal, fish and bird products and expression of their effects through various diseases, increased incidence of several zoonotic diseases, development of resistance among micro-organisms against antibiotics, development of superbug etc. are examples.

In this context, the idea of using plant derived medicines among the animals is a good concept. But the pharmaceutical companies producing various herbal medicines for animals are following the same concept of preparation of marketable medicines like that of modern allopathic medicines. Parts of the reported medicinal plants are generally dried, stored,

processed and mixed with chemical preservatives, coloring and palatable materials before marketing. In the way of collection, transportation, storage and processing of these plant parts, almost all the volatile and aromatic ingredients may be lost. Some of the temperature and humidity sensitive ingredients may also become ineffective due to these reasons (Pattanayak *et al.*, 2013).

So, the idea of use of modern medicines among animals may be shifted to the use of medicine of herbal origin. For that, every animal farm may be added with a medicinal plant garden of selected plants for supply of fresh inputs. These can be used for better production and prevention as well as treatment of at least minor and moderate ailments. The plants easily cultivable at the local area may be given importance. In a country of Torrid Zone like India, many such plants grow as weeds or as naturally growing plants of the area. Selection of the plant should be according to the species of animal of the farm and their requirements. Farm animal manure may be used instead of inorganic fertilizer. Trained personals may be used for mixing of parts of plants and their use. As a single plant can serve many purposes by use of its different parts in different combinations, the study to validate the efficacy of such plants requires proper pre-planning. A list of medicinal plants having reported use in various purposes related with health and production of animals was published by Pattanayak *et al.* (2013), which may be enriched further and validated properly for that purpose.

B. Export oriented industry

In the present system of research, for designing and development of medicine and movement of such medicines to the bedside of

patients, a huge amount of fund is invested. The countries with ability to invest more and more money are ahead of the other poor countries in the way of production and export of such newly developed medicines. The developing and the poor countries, most of which are situated at the torrid zone of the globe, are mainly importers of such modern medicines.

The countries having huge resources of natural plants are definitely having huge resources of medicinally active plants. India is one such country. The validated succulent plant part extracts of those medicinal plants may be utilized for creation of one export oriented agro-medicine business. After validation and study of LD₅₀, ED₅₀, Acute Toxicity, Chronic Toxicity and other related studies, succulent plant part extracts may be exported for herb based treatment of human being throughout the globe as an effective alternative of modern medicine.

Some low cost techniques like dosing of such medicine in small aliquots, storing at some low temperatures (0°C, - 10°C, - 20°C *etc.*) or freeze drying as per requirement and research reports are to be employed for that purpose. A new journey can be started for creation of a new alternative of modern medicine as well as creation of many cheap, export oriented, labor involving industries.

CONCLUSION

The succulent part extracts of reported medicinal plants may be used commercially after validation. Organic animal farm may be started with added medicinal plant garden with the farm. After studies related with dosing, toxicity *etc.*, the extract of the medicinal plants may be carried worldwide with the assistance of different cooling systems available. That may create a new avenue of alternative medicine as

well as export oriented industries in many poor and developing countries.

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