Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(2): 1997-2000

Received: 13-01-2018
Accepted: 14-02-2018

Ambreen Hamadani
Division of Animal Genetics and Breeding, Faculty of Veterinary Sciences & Animal Husbandry, Shere Kashmir University of Agricultural Sciences and Technology of Kashmir, Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

Nazir A Ganai
Division of Animal Genetics and Breeding, Faculty of Veterinary Sciences & Animal Husbandry, Shere Kashmir University of Agricultural Sciences and Technology of Kashmir, Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

Syed Shanaz
Division of Animal Genetics and Breeding, Faculty of Veterinary Sciences & Animal Husbandry, Shere Kashmir University of Agricultural Sciences and Technology of Kashmir, Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

Nusrat Khan
Division of Animal Genetics and Breeding, Faculty of Veterinary Sciences & Animal Husbandry, Shere Kashmir University of Agricultural Sciences and Technology of Kashmir, Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

S Saba Bukhari
Division of Animal Genetics and Breeding, Faculty of Veterinary Sciences & Animal Husbandry, Shere Kashmir University of Agricultural Sciences and Technology of Kashmir, Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

Zaffar Iqbal
Division of Animal Genetics and Breeding, Faculty of Veterinary Sciences & Animal Husbandry, Shere Kashmir University of Agricultural Sciences and Technology of Kashmir, Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

Aadil Ayaz
Department of Zoology and Biotechnology Hemvati Nandan Bahuguna Garhwal University, Uttarakhand, India

Correspondence
Ambreen Hamadani
Division of Animal Genetics and Breeding, Faculty of Veterinary Sciences & Animal Husbandry, Shere Kashmir University of Agricultural Sciences and Technology of Kashmir, Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

Usage of phytochemicals in veterinary practice

Ambreen Hamadani, Nazir A Ganai, Syed Shanaz, Nusrat Khan, S Saba Bukhari, Zaffar Iqbal and Aadil Ayaz

Abstract
Plants have been and still are a major source of medicaments either as traditional preparations or by supplying pure active principles. Knowledge of plant phytochemistry provides a basic framework for using plant materials as potential therapeutic agents in the field of medicine. Phytochemicals have always been in existence and medicinal plants have been traditionally used all over the world. Even today, ethno-veterinary medicine for disease treatment and prevention in livestock is often the only available choice among rural and peri-urban populations, especially in developing countries like India. Moreover, livestock is an important contributor to the economic development of the country and globally, about 90% population still relies on ethno-veterinary remedies for livestock. Nowadays, due to the development of new and sophisticated techniques, phytochemical analysis has attracted the attention of plant scientists and veterinarians alike. Many plants have been identified which show promising abilities in disease prevention and cure.

Keywords: phytochemicals, veterinary practices, nutrients, medicaments

1. Introduction
Phytochemicals are chemicals that are naturally found in plants [1]. They add color, odor and flavor to the plants. The word *phyto* is derived from a Greek work meaning 'plant'. Nowadays, Phytochemicals are described as chemicals that are derived from plants, affecting human and animal health but are not themselves nutrients. Plant-based foods are complex mixtures of bioactive compounds. Insights into the understanding of individual chemicals enables scientists to study the potential health effects of food containing such. Plants have been and still are a major source of medicaments [2] either as traditional preparations or by supplying pure active principles since times immemorial. Knowledge of plant phytochemistry provides a basic framework for using plant materials as potential therapeutic agents in the field of medicine. Phytochemicals have always been in existence and medicinal plants have been traditionally used all over the world.

2. History of phytochemicals
Use of specific phytochemicals as remedies for various maladies developed by trial and error over many centuries. The Chinese have the oldest medicine system and it has evolved greatly over the years [3]. More than 5000 years ago, the Chinese based their medicine on the yin and yang principle and on the basis of the five elements. Their earliest record dates back to 2800 BC; The Great Native Herbal. In Greece, Dioscorides came up with *De Materia Medica* in the first century AD.
In India, Ayurveda and Unani medicine have been of prime importance and a predominant practice was to use active principles in plants for curing disease. Kalhana, in his book Rajtarangini, (1149-50 A.D.) mentions of preservation of plants and plant products for medicinal purposes. Hippocrates (460-377 BC) and Aristotle (384-322 BC) helped in spreading the knowledge of herbal medicine from India and Egypt to Europe.
In the 19th and 20th century, scientists discovered many active ingredients, which had medicinal or pesticidal properties, e.g. salicylic acid, morphine and pyrethroids (pesticides). In the 1980s, many laboratories started to identify phytochemicals in plants for their use in medicines. Epidemiological studies in relation to these phytochemicals were also done.

3. The current scenario
Human medicine developed faster than animal medicine. Approximately one-half of all licensed drugs that were registered worldwide in the twenty-five-year period before 2007 were

natural products or their synthetic derivatives. Today, the use of plants for medicinal purposes is in human medicine (93.6%) and there is little contribution of plants for veterinary remedies (6.4%). 1.66% of drugs derived from plants show an overlap between human and veterinary use, with identical purposes [4]. Therefore, research on how phytochemicals currently in use for humans can be used for animals having similar physiologies is the need of the hour. For veterinary practice, the knowledge of chemical constituents of plants is essential, not only for the discovery of therapeutic agents and new resources but also for the proper application of this knowledge in disease diagnosis and treatment.

There is a growing need to decrease pollution and environmental damage arising due to animal agriculture. The European Union has already banned the use of antibiotics and other chemicals [5], which are used in promoting growth and reducing environment pollutants due to the risk of chemical residues in food and antibiotic resistance. As a result, scientists have intensified their efforts in exploiting plants, natural plant compounds or plant extracts as potential alternatives for enhancing the livestock productivity.

Even today, ethno-veterinary medicine for disease treatment and prevention in livestock is often the only available choice among rural and peri-urban populations, especially in developing countries like India. Moreover, livestock is an important contributor to the economic development of the country Globally, about 90% population still relies on ethno-veterinary remedies for livestock. One important reason for this is the fact that the cost of allopathic medication is skyrocketing. The use of cheap and easily available phytochemicals can thus be made by taking a leaf out of the ethno-veterinary practices. Phytochemicals can be used either by feeding whole plant parts or by the process of extraction of these chemicals and delivering in concentrated forms.

4. Importance of phytochemicals

Findings from laboratory studies have shown that phytochemicals may stimulate the immune system, absorb free radicles, block carcinogens, reduce inflammation, prevent DNA damage and promote DNA repair, slow growth rate of cancer cells, cause damaged cells to undergo apoptosis before they can reproduce, counteract infection, alleviate pain and regulate hormones.

Nowadays, due to the development of new and sophisticated techniques, phytochemical analysis has attracted the attention of plant scientists and veterinarians alike. These techniques give solution to systematic problems and also search for additional resources of raw materials for pharmaceutical industry.

Thousands of phytochemicals have been identified so far, and scientists have only begun to truly understand the importance of these chemicals. Even as we claim to be technologically advanced, we mostly do not create any new compounds but only make chemical replicates of the phytochemicals already present in plants. Lately, due to changing global needs, there is a renewed interest in the discovery of more phytochemicals. Plant phytochemical remedies are used in many species including ovine, bovines, swine, poultry, equines, rabbits and canines. Prime disorders addressed by these preparations comprise gastrointestinal ills, postnatal maladies, wounds and dermatological complications. The authors often found the use of these remedies to be fully consistent with their utilization in human remedies.

5. Types of Phytochemicals

Plants synthesize a wide variety of chemical compounds. These are sorted by their chemical class, bio-synthetic origin and functional groups into primary and secondary metabolites. The quantity and quality of phytochemicals present in plant parts may differ from one part to another. Phytochemicals can also be classified into hydrophilic and hydrophobic compounds [6], of which a great majority of terpenoid and polyphenolic compounds, as well as alkaloids, carbohydrates and non-protein amino acids are well known. Phytochemical analysis results state that terpenoid, steroids, tannins, flavonoids, saponins, and carbohydrates are commonly present in plants and it is these secondary metabolites that have therapeutic activities and may act as synergistic or antagonistic agents in disease therapeutics.

Plants having polyphenols prevent protein degradation in the rumen, increase effectiveness of microbial protein synthesis and reduce methane emission, act as antioxidants, antibacterial and anthelmintic agent, change meat color and increase n-3 fatty acids and conjugated linoleic acid in meat. *Moringa oleifera* leaves are a source of plant growth factor(s), antioxidants, beta-carotene, vitamin C, and various glucosinolates and their degraded products are antibacterial, antioxidant, anti-carcinogenic and anti-pest agents. Tannins have physiological astringent and hemostatic properties. These hasten wound healing and improve the condition of inflamed mucus membranes and also prevent microbial growth by precipitation of microbial proteins and by making nutritional proteins unavailable. Furthermore, they form irreversible complexes with proteins that are rich in proline which consecutively results in the inhibition of cell protein synthesis. They are also stable and potent anti-oxidants and binders. Tannins may be used for treatment of diarrhea and dysentery in animals. High level of tannins in feed can have adverse effects on both rumen microflora and digestibility of feed. Moderate levels of tannins (less than 4%) in forage legumes can have beneficial responses in ruminants, resulting in higher growth rates and milk yield, however, even in ruminants, levels of tannins exceeding 6% of the diet resulted in negative affect on growth rate and milk yield [7]. However, appropriate use of these phytochemicals in sheep and cattle leads to higher retention of nitrogen.

Saponins have shown properties that may be useful for upper respiratory tract inflammation, as antidiabetics and also as cardiotonics [8]. Saponinsalso possess anti-fungal properties. Saponin based adjuvants stimulate cell mediated immunity and enhance antibody production. Pertinent to mention that they have the benefit that only a low dose is required for adjuvant activity. Saponin-rich plants such as quillaja, yucca and Sapindus saponaria increase efficiency of rumen fermentation, decrease methane emission and enhance growth of microflora. They have also reported to decrease cholesterol levels in monogastric animals, increase growth of fish (Common carp and Nile tilapia) and act as molluscicidal agents.

Lectins have cyclooxygenase (COX) inhibitory potential which can be utilized for the treatment of inflammation. They are also seen to have anticancer properties [9]. Emodin is yet another phytochemical which has inhibitory action against *Bacillus subtilis* and *Staphylococcus aureaus.* Flavonoids and Phenolics may be used in the control & prevention of tissue damage by oxygen radicals. Antioxidants are phytochemicals that protect cells from damage by free radicals. Many vitro and in vivo studies have proven that antioxidants help prevent the free radical damage which might otherwise cause cancer

and heart disease. Antioxidants are present in many culinary and medicinal herbs. Thus, antioxidants reduce the risk of heart disease and cancer [10]. The combination of the antioxidants beta-carotene, selenium and vitamin E may reduce the incidence of cancer. Phytochemicals may also play a vital role in the eradication of dietary antibiotic inclusions for the purpose of growth promotion.

6. Plants used in veterinary practice

In day to day veterinary practices, parts of plants containing high concentration of specific phytochemicals are used. The main parts of plants used in healing are the storage organs, namely bark, bulbs, tubers and rhizomes, which are characterized by abundant quantities of storage lectins and proteins. The aerial regions of the plants are used more frequently (26%), leaves (14%), flowers (14%), fruits, and seeds (16%, including olive oil) and roots (5%) [4][11]

Legumes such as *Entada phaseoloides* seeds contain high levels of trypsin inhibitor and saponins, *Sesbania aculeate* seeds are rich in non-starch polysaccharides and *Mucuna pruriens* var. utilis seeds rich in l-3,4-dihydroxyphenylalanine and have potential use in fish feed. *Cassia fistula* seeds are a source of antioxidants. *Canavalia ensiformis, C. gladiata* and *C. virosa* seeds contain high levels of trypsin inhibitors, lectins and canavanines.

Rosa sp. (Gulab) petals are given to cure cold in cattle, *Helianthus annus* L. (Gul-e-aftab) seeds is used as a tonic for cattle, Turmeric has its use in mastitis, applied on udder FMD ulcers Wound and having healing and antiseptic effect, *Rheum emodi* powder is sprinkled on ulcers, wounds for quick healing & is also used as laxative, tonic & for GIT bleeding, *Allium cepa* L. crushed bulbs are used to stimulate the oestrus cycle in cows [12], *Datura stramonium* L. crushed seeds when given along with egg yolk are said to cure urinary bladder infections, *Rumex acetosa* crushed roots are made into balls and given along with salt to cattle to cure cough, gaseous bloat and sprained body parts, *Conyza canadensis*, crushed aerial portion is made into small soft balls and fed to cattle against indigestion and dysentery [13]. *Annona squamosa* L. leaves are left in hens nest or rubbed on floor to keep away vermin [14], *Allium sativum Liliaceae* (Garlic) bulb, *Kalanchoe pinnata Crassulaceae* (Wonder of the world) leaves, *Momordica charantia* vine, *Neurolaena lobate* leaves are all used for reduced appetite, *Chrysobalanus icaco* containing Chrysobalanaceae is used for the treatment of Pox, Citrus species, Rutaceae juice and peel is given for respiratory conditions and heat stress. *Coffee arabica / robusta* grounds may also be used for Respiratory conditions. *Aconitum heterophyllum* is a bitter tonic especially given for fever, *Potato protein* in diet increases average daily gain (ADG) parameters and gain and also reduces microbial populations in the caecum, colon and rectum, as well as in faeces in pigs. *Cannabis sativa* (Charas) leaves are crushed and given to animals for two days for indigestion. *Bergenia ligulata* (Pulfort) dried roots are ground to make powder is given to cattle with warm water during diarrhea, weakness and to enhance milk production, also Sonchus arvensis are fed to goat and cattle for the same reason.

Plants used traditionally for the treatment of wounds and placenta retension in livestock have high levels of dichloromethane (DCM) and 90% methanolic extracts, when screened for antibacterial, anti-inflammatory and mutagenic activity were found effective in combating infection and for pain reduction. *Brassica rapa* L. leaves is given to cows for the removal of placenta. *Hypoxis hemerocallidea* and *Equilobium parviflorum* inhibit Escherichia coli. *Scilla natalensis* and *Ledebouria ovatifolia* contain phytochemicals having anti-bacterial, anti-inflammatory, anathematic, anti-schistosomic and anticancer. Antibacterial activity is also exhibited by DCM extracts of *Dicerocaryum eriocarpum, Pterocarpus angolensis, Ricinus communis* and *Schkuhria pinnata* also have high antibacterial activity. *Nicotiana tabacum* leaves, have anti helminthic properties against Haemonchus *contortus* worms. *Artemisia absinthium* L. extract of the whole herb is used to cure the liver infection in cattle and is also a wormicide, *Cedrus deodara* oil is used for foul ulcers and wounds also applied on skin for treating ticks fleas lice. *Ananas comosus* (pine apple), *Momordica charantia* (bitter gourd) and *Azadirachta indica* (neem) contain anthelmintic compounds which are used for controlling internal parasites. Aqueous bulb extracts from *Allium sativa, Warburgia salutaris* and *Tulbaghia violacea possess* antifungal efficacy and both proved to be effective against fungus. *Lippia javanica* for the treatment of cough, cold and other problems of the bronchus [15] and to disinfect meat contaminated with anthrax [16]. Leaf decoction of *Caladium bicolor* is used to get rid of external festers in cows [17].

7. Conclusion

Although plant secondary metabolites have a wide array of benefits in animals, some phytochemicals have frequently been shown to have adverse effects on animals. The effects overall may depend a great deal on the chemistry of the compounds, their concentration in the diet, the amount consumed on the health status of the animals. Excessive usage of these compounds may have detrimental effects, however they may prove to have excellent effects when used optimally.

8. Acknowledgement

The authors acknowledge the support of Faculty of Veterinary Sciences and Animal Husbandry, SKUAST-Kashmir.

9. References

1. Bathaie SZ, Faridi N, Nasimian A, Heidarzadeh H, Tamanoi F. How Phytochemicals Prevent Chemical Carcinogens and/or Suppress Tumor Growth? Enzymes. 2015; 37:1-42.
2. Nath SC, Borah SM. Harnessing medicinal plants through ethnobotanic approach in north-east India. Sci. Cult. 2011; 77(11-12):441-445.
3. Traditional Chinese Medicine: In Depth. National Institute of Health. https://nccih.nih.gov/health/whatiscam/chinesemed.htm. March 23, 2017.
4. Bonet MA, Valles J. Ethnobotany of Montseny biosphere reserve (Catalonia, Iberian Peninsula): Plants used in veterinary medicine. J Ethnopharmacol. 2007; 110:130-147.
5. Founou LL, Founou RC, Essack SY. Antibiotic Resistance in the Food Chain: A Developing Country-Perspective. Front Microbiol. 2016; 7:1881. doi:10.3389/fmicb.2016.01881.
6. Acamovic T, Brooker JD. Biochemistry of plant secondary metabolites and their effects in animals. Proc Nutr Soc. 2005; 64(3):403-12.
7. Makkar HPS. Effects and fate of tannins in ruminant animals, adaptation to tannins, and strategies to overcome detrimental effects of feeding tannin-rich feeds. Small Rumin Res. 2003; 49:241-56.

8. Blázovics A, Prónai L, Fehér J, Kéry A, Petri G. Natural antioxidant extract from Sempervivum tectorum. Phytother Res. 1993; 7:95-97. doi:10.1002/ptr.2650070124
9. De Mejía EG, Prisecaru VI. Lectins as bioactive plant proteins: A potential in cancer treatment. Crit. Rev. Food Sci. Nutr. 2005; 45(6):425-445. doi:10.1080/ 10408390591034445
10. Leopold JA. Antioxidants and Coronary Artery Disease: From Pathophysiology to Preventive Therapy. Coron. Artery Dis. 2015; 26(2):176-183. doi:10.1097/MCA.0000000000000187
11. Volpato G, Godínez D, Beyra A, Barreto A. Uses of medicinal plants by Haitian immigrants and their descendants in the Province of Camagüey, Cuba. J Ethnobiol Ethnomed. 2009; 5:16. doi: 10.1186/1746-4269-5-16.
12. Mir MY. Ethnoveterinary studies in tribals of Kupwara, J & K, India. Int. J. of Multidisciplinary Res. and Dev. 2014; 1(6):92-96.
13. Rajoriya CM, Choudhary RG, Shah IA, Rawat RS, Jat BL. Ethno-medicinal Survey of North Kashmir with Special Reference to Bandipora. IJRASET. 2016; 4:95-106. https://doi.org/10.1016/bs.enz.2015.06.003
14. Standley PC. Trees and Shrubs of Mexico. Smithsonian Press, Washington, D.C., USA. 1920-1926.
15. Pascual ME., Slowing K, Carretero E, Sanchez D, Villar AJ. Lippia: traditional uses, chemistry and pharmacology: A review. J Ethnopharmacol. 2001; 76:201-214.
16. Viljeon AM, Subramoney S, Van-Vuuren SF, Baser KH, Demirci B. The composition, geographical variation and antimicrobial activity of Lippia javanica (Verbanaceae) leaf essential oils. J Ethnopharmacol. 2005; 96:271-7.
17. Balbach A. A flora nacional na medicina domestica, Itaquacetuba, Sao Paulo, Brazil. 1980, 2.