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Review Article

Ethnoveterinary perspectives and promising future

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ABSTRACT

In this review, we have discussed the recent potential effects of plants and their derivatives in treating diseases of veterinary importance in livestock. The therapeutic value of these natural products depends upon their bioactive metabolites that are developed and isolated from crude plants, thus produced a selective action on the body. The crises of drug resistance in most pathogenic bacteria and parasites that cause economic loss in animals necessitate developing new sources for drugs to overcome therapeutic failure. We summarized the different antibacterial and antiparasitic plants with their bioactive compounds that have widely used in animals. Finally, the environmental friendly feed additives that may be used as alternatives to an antibiotic growth promoter for broiler chickens were illustrated.

1. Introduction

In almost all countries, plants have been used broadly all over history for treatment and prevention of different diseases and infections in human and domestic animals. Nowadays, these traditional remedies are encouraged in veterinary medicine due to their promising therapeutic efficacy minimal side effects of chemotherapeutic agents and decreasing of drug residues in animal products that consumed by human [1]. Perspective and future approaches to ethnopharmacology research are developed parallel with the advances in laboratory and clinical sciences especially phytochemistry and pharmacology [2]. Researchers should have an apparent vision for those new trends to achieve practical and applicable resonance approaches and as in all disciplines adherence to internationally recognized for the ecological factors, ethical and economic issues and the appropriate use of plants [3]. Human ethnopharmacology has become an information science depends upon professional researches that reported on published literature [4]. An accurate methodological approach in ethnopharmacology invariably requires the use of a database that ideally serves two main functions: storage of data, and facilitation of analysis, such as quantification and comparisons.

In this review, we discussed the basic requirements and standards to verify ethnoveterinary information. Future uses of such information both in the experimental research and applied missions emphasized the various tasks of such data generated in herbal field studies [5]. Systematic pharmacovigilance is necessary to augment consistent pharmaco-toxicological information on the safety for the development of right plans for safe effective use [6].

There is an increasing substantiation to explain that synergistic and/or side-effects counteracting combinations of local herbs. Herbal medicine as an alternative remedy has already developed and is likely to play the more significant role. The scientific and local names of mostly used herbs are essentially requested as they may apply to more than one scientific species, which may or may not be closely related. For example, there are a number of plant species of “Chamomile,” including *Anthemis nobilis* L., *Matricaria chamomilla* L., *Matricaria discoidea* DC, *Cotula matricarioides* (Less.) Bong and *Tanacetum annuum* Pursh. On the contrary, a scientific species may be famous by a number of local plants and classified in folk medicine as they do not correspond to the same botanical category [5,7].

The use of separated bioactive alternatives is a talented approach, which has established the high efficacy with little doses than parent crude herb. Nowadays, natural organic drugs as strychnine, atropine, turpentine oil, cater oil and ephedrine were previously discovered and achieved significant success in veterinary medicine [8]. Garlic, is an extensive example of botanical, which is gaining acceptance as an alternative to patentable chemical drugs. The medical uses of garlic all over the ages in prevention and treatment of diseases in human and domestic animals had potential benefits. Garlic achieved an intentional success for control of hypertension and hypercholesterolemia besides its use as a food additive [9]. Garlic was in use at the beginning of recorded history and was found in Egyptian pyramids and ancient Greek temples. In many cultures, garlic was administered to provide strength and increase work capacity for manual workers [10]. The interest of garlic advantages has been developed in all culture as the efficacy of garlic is obtained from all experimental trials [11]. The different

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Table 1
Summary of different actions and their mechanism of garlic extract (*Allium sativum* L).

Actions	Mechanism of Actions	References
Anticoccidial	Decreases *Eimeria vermiformis* oocysts output in mice Prophylactic effect against hepatic coccidiosis in rabbits	[14] [15]
Amebicidal	Inhibition of *Acanthamoeba castellanii* life cycle	[16]
Antipseudomonas	Inhibition biofilm coated *Pseudomonas aeruginosa* bacteria that leads to failure of antibacterial treatment and humoral immunity	[17]
Antibacterial	Significantly inhibits the growth and division of oral pathogens Food preservatives so prevent food poisoning crises	[18] [19–21]
Antioxidant	Potent antioxidant activity Antagonizes β-hexosaminidase enzyme release so it has a potent antiallergic effect	[22,23] [24]
Antileishmaniasis	Immunostimulant via activation the efficacy of macrophages to engulf the intracellular protozoan Leishmania	[25,26]
Antischistosomiasis	Potent broad spectrum against all stages of Schistosoma life cycle	[27–29]
Hepatoprotective	Increases all the hepatic biomarkers antioxidant enzymes concerned with oxidative stresses	[30]
Antithrombus	Inhibition of prostaglandin synthesis through cyclooxygenase pathway and prevents platelets aggregations in blood vessels or lungs	[31]
Antifungal	Inhibition of saprophytic fungal growth that induced external mycosis Inhibition of metabolism process of *Candida albicans* by NADH oxidation and glutathione depletion, and increased reactive oxygen species (ROS)	[32] [33]
Insecticide	Potent natural larvicidal activities against the filarial mosquito *Culex quinquefasciatus*	[34,35]
Anticancer	Suppress the growth of human breast cancer cells *in vitro* through several mechanisms the activation of metabolizing enzymes, the suppression of DNA, antioxidant activity, and stop cell division	[36–39]
Aquacultures	Highly efficacious in most infectious fish diseases Immunostimulant and antiprotozoal activities in different aquacultures	[40] [41]

pharmacological actions of garlic with possible mechanisms of action and exploring garlic's potential for disease prevention and treatment in human and domestic animals are summarized in Table 1. Previous literature that concerned with ethnoveterinary medicine were conducted in certain regions or countries [12,13] and they focused on their traditional and local uses. Consequently, the nature of plant species, bioactive metabolites, weather, cultivation method and animal diseases will be different from the Far East to the Middle East. Moreover, the knowledge on the environment-friendly feed additives that may be used as alternatives to an antibiotic growth promoter for broiler chickens are intermittent. Consequently, the aim of this review is to correlate the ethnoveterinary uses with their secondary bioactive metabolites content. Moreover, we select global plant species that exist all over the world especially Arabian countries and used alternatively to chemicals.

2. Antibacterial activity of some plant extracts against pathogenic bacterial strains

Although many new antibiotics have produced in the recent decades, bacterial resistance to these chemotherapeutic agents has increased. Generally, bacteria have the inherited ability to transmit and acquire resistance to antibacterials, which are developed to infectious diseases in human and domestic animals [42].

Additionally, weak immunity in host cells and the ability of bacteria to develop biofilm-associated drug resistance have further increased the number of life-threatening infections [43]. Thus; bacterial infections remain a major causative agent of death, even today. The use of several antibacterial agents at higher doses may cause toxicity. This has prompted researchers to explore alternative new key molecules against bacterial strains.

There is an efficient support that many of the health-promoting activities of phytochemicals also intercede through their capacity to augment the host's defense against microbial infections [44]. The efficiency of essential oils varies from one to another as well as against different target bacteria depending on their cell membrane and cell wall structure (Gram-positive and Gram-negative bacteria) [45]. The cell wall of Gram-negative bacteria is more resistant to the toxic effects of essential oils than Gram-positive bacteria [46]. The structure of the Gram-positive bacterial cell wall allows hydrophobic molecules to easily penetrate the cells [47].

The antibacterial effects of a large number of plant extracts and oils have been evaluated and reviewed [48,49], and the mechanisms that facilitate the bioactive compounds of herbs to combat bacteria have been discussed [50]. Different antibacterial extracts and oils with their mechanisms and susceptible bacterial species are illustrated in Table 2.

The results show that these mechanisms differ significantly depending on the essential oil components [51]. Essential oils exhibit extremely good antimicrobial effects against bacteria, yeasts, fungi, and viruses [52]. Accordingly, it was assumed that the essential oils may have antimicrobial activity by modulating bacterial and fungal targets involved in the cytoplasm and cell wall metabolism [53].

It is affirmed by several researchers that especially monoterpenes will increase cytoplasmic membrane fluidity and permeability, disturb the order of membrane implanted proteins, inhibit cell respiration, and alter ion transport pathways [54,55]. However, the assessment of different results in the literature is frequently complicated because of the use of different local plant species, diverse techniques, bacterial strains, and incubation period [56].

3. Plants with antiparasitic activity in animals

The crises of drug resistance in parasites that cause different diseases in animals necessitate developing new sources of drug to overcome failure therapy. Such parasites cover a broad phylogenetic range and include protozoa, helminths and arthropods. In order to achieve effective parasite control in the future, the identification and diagnosis of resistance will be essential [77]. Many new natural products have revealed antiparasitic properties of potent efficacy and selectivity, as will be shown in this review for plant-derived bioactive secondary metabolites [78]. Parasitic infestations reduced productivity in livestock, particularly in poor worldwide. Phytomedicine has been used traditionally to treat parasitism and improve the performance of livestock. Scientific validation of the anti-parasitic effects and possible side-effects of plant products in animals is necessary prior to their approval for parasite control [79].

A variety of methods has been explored to validate the anthelmintic