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Review Article

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Medicinal Herbs – Boon for Modern Veterinary Therapeutics

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Abstract

Rasayan Chikitsa (Herbal therapy) is an ancient process of Indian treatment. Ayurveda was the only way of treatment in the then periods. In the global perspective, American, Arabian and Chinese civilizations were found to prefer this technique. Medicinal plants are efficient in preventive, promotional and curative applications. These are also experts in fertility enhancement and immunomodulatory effects. As a result, gradually the modern pharmacological advancements have curved to utilise their benefits. Such traditional medicines although prove much effective at a lesser dose but their desirability seems to be limited. As, 'old is gold', though the herbal medicines are replacing the space dramatically. Because of curing, alleviating and preventing onset of diseases, phytotherapy in animal health care also possesses much desiring for its choice. In veterinary, medicines based on natural raw materials and folk remedies from plants are in practice. Though, it is generally preferred for prophylactic measures, also vividly used for therapeutic applications in cases of milder and chronic diseases, recurrent infections, ecto-endo parasitic infestations. However, in organic livestock production also, herbal applications are very beneficial in order to combat the battle with chemical toxicities. Thus, an enormous growth has been noticed in the recent past for their successful curative approaches, minimum complications, cost effectiveness and easy availability. Hence, herbal medicines should be promoted for the sake of animal wellbeing, better husbandry benefits and good public health.

Keywords: Medicinal plants, herbal extracts, antibiotic residue, growth promoters

1. Introduction

Developing and designing of newer drugs is an ongoing process since time immemorial. This is essential because less effective or ineffective drugs are needed to be improved or replaced (Pattanayak et al., 2016). But the modern development curve shows a decline in such medicinal innovations, rather plant-based remedies are gaining popularity day-by-day in the therapeutic aspects (Chakraborty and Pal, 2012). Only for medicinal purposes, now 35,000 or more plant species are in use all over the world (Dandotiya et al., 2013). Although usage of plants or herbs is an age-old process in India. Evidence can be found in *Nakul Samhita* written in 5000 BC. Besides, India is the world highest producing vessel of medicinal plants and therefore is known as 'botanical garden of the world'

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(Umashanker and Shruti, 2011). Presently, an estimated 1.5 million of traditional medicine practitioners of India are preferring these plants for different therapeutic applications and around 2000 tonnes of such herbs are being used by over 7800 medicinal drug manufacturing units annually (Verma and Singh, 2008).

Apart from treatment, herbs also play an important role in enhancing body physiology. Calves up to 3 months of age is considered to be the most critical period of their life because of their low immunity which makes them vulnerable to diseases (Rzedzicki and Furmaga, 1993; Stenzel et al., 2000). In fact, the growth of calves is the primal challenge and even vital too as this is the deciding factor of working efficiency in the future. The main hurdle lies with the gastrointestinal infections that enable enteric bacterial imbalance and render proper absorption of nutrients leading to poor growth and even mortality (about 30%). This situation can be easily mitigated by dietary supplementation of probiotics and other growth enhancers. But medicinal plants as feed additives proved themselves in this regard (Aboul-Fotouh et al., 2000). Even the World Health Organization is now encouraging the application of medicinal herbs. This success has resulted in improving the rumen ecology, performance and health status of the animals (Kamra, 2005; Manzanilla et al., 2001; Wanapat et al., 2008).

2. Worthiness of Medicinal Herbs

According to Hindu mythology, botanical plants are adjectivized as '*Sanjeevani booti*'. Herbs possess anti-stress, adaptogenic, anti-aging and immunomodulatory property. Also, they can heal successfully a variety of conditions in animals and birds (Dhama et al., 2012). These are eminent players in combating parasitism and for so, medicinal plants are been in use for centuries worldwide. For example, for gastro-intestinal parasitism, seeds of garlic, onion and mint are very effective. Similarly, extracts of the tobacco plant and leaves, dried flowers and oil from *Chenopodium ambrosioides* are boons for ectoparasites and anthelmintics respectively, which are in use since early 1900s (Mirzaei-Aghsaghali, 2012). The suppression of the characteristic smell of cow milk has also been recorded when lactating dairy cows were fed with specific dried herbs (Ando et al., 2001).

3. Functional Unit of Medicinal Herbs

To alleviate stress and to improve growth, animals are fed with antibiotics as growth promoters. The continuous feeding of sub-therapeutic levels of antibiotics in animal feed results in the presence of antibiotic residues in animal products (Jin et al., 1997). This limitation has motivated to replace the antibiotics with appropriate alternatives (Cross et al., 2007). As a result, various studies came out with plant extracts as a weapon of solution in this regard (Wallace, 2004). Several plants produce secondary metabolites like saponins and tannins having antimicrobial properties. Further, these compounds are found to cause modulation in ruminal fermentation which improves nutrient utilization by animals (Hristov et al., 1999; Wang et al., 2000). Metabolic modifications in primary metabolism products (carbohydrates, amino acids and fatty acids) have generated such active principles of plants. Most of these active secondary plant metabolites belong to isoprene derivatives, flavonoids, heterosides, alkaloids, saponosides, terpenoids and glucosinolates classes possessing versatility in action (Davidović et al., 2012). These compounds can act as antibiotics or antioxidants in vivo as well as in vitro through food and may affect the physiological and chemical function of the digestive tract along with other plant metabolites (Rahimi et al., 2011). Also, these herbal compounds are keen to influence the stimulation on bile secretion and pancreatic enzymes to the maximum (Platel et al., 2002). Besides, tannins, saponins and herbal extracts show potency in the digestibility of nutrients and production performance of ruminants (Beauchemin et al., 2007; Benchaar et al., 2006, 2008; Busquet et al., 2006; Lila et al., 2003). Though herbs may contain numerous photochemical compounds with antimicrobial effects which may prove useful or harmful on animals, these are fully dependent on the type and concentration of such compounds (Acavomic and Brooker, 2005; Cowan, 1999; Wink, 2004).

4. Properties

Herbs are a potent anti-inflammatory, antibacterial, antiviral and antifungal agents. Are efficient enough to promote multiple immunomodulatory actions. These include immunoglobulin production, cytokine secretion modulation, histamine release, lymphocyte proliferation, phagocytosis promotion (Spelman et al., 2006). Medicinal plants can judiciously exhibit beneficial biological activities proving themselves as anti-stress, adaptogenic and cytoprotective (Patwardhan and Gautam, 2005). On application, improvements seen in flu, allergies, cold, septicaemia, viremia, rheumatoid arthritis, hepatitis, pulmonary diseases, asthma, skin infections, chemical intoxications etc. These are even capable of delaying aging and effective in treating cancer (Kamiyama et al., 2005; Mathew et al., 2010; Umashanker and Shruti, 2011). Ear infections, wounds, burns and skin irritation like conditions can also get relief on their involvement (Mirzaei-Aghsaghali, 2012). Moreover, herbs extend their help in improving mental functions and preventing diseases and enhance vaccine responses as well (Ragupathi et al., 2008).

5. Advantages

Antibiotic supplementation in animal feed leads to bacterial resistance which infers a major public health concern across the globe (Benko et al., 2008). Gradually, it has turned into a major problem in both human and animal medicines worldwide. As a result, European Union has already banned using antibiotics as a feed additive (Russell and Houlihan, 2003). Since 1997, the authorization of

antibiotics like avoparcin, zinc-bacitracin, spiramycin, tylosin and virginiamycin and growth promoters like carbadox and olaquindox as feed additives has been ceased (Dibner and Richards, 2005). The principal advantage of herbal medicines over conventional medicines lies with the drug resistance. There remains zero drug resistance in the animals indicating no residual drugs in the animal products consequently. Also, these drugs incline to be as broad-spectrum medications (Mwale et al., 2005). Side-by-side, they work soothingly which are tolerated by most animals. Generally, are quite useful in chronic cases with higher efficacy. Moreover, are easily accessible, preparable and administrable. Being natural, these are environment friendly and show no serious environmental effects (Patwardhan et al., 2004). Comparatively, these are much safer with no side-effects or lesser effects having fewer risks. Because of reduced side effects and natural origin, the herbal application is gaining popularity tremendously and their growth increasing exponentially. Side-by-side, are cost effective and assure total safety (Mahima et al., 2012). Therefore, herbal plants are needed to be employed as mainstream drugs with more emphasis to escape the escalating costs of traditional drugs.

6. Therapeutic Applications of Medicinal Herbs

Skin, seed, fruit, leaves and other organs of the plants and even the intact plants are very important in the field of prophylaxis of a vast array of diseases. These are vital because of the presence of active ingredients in them and hence, have been in use based on long-term experience. Thyme (*Thymus vulgaris*), mint (*Spearmint sativum*), oregano (*Mentha pulegium*), cumin (*Cuminum cyminum*), camel thorn (*Alhagi persarum*), garlic (*Allium sativum*), Eucalyptus (*Eucalyptus*) etc. are common age-old in use plants.

Such medicinal plants and herbal extracts can deal with infectious, non-infectious diseases and disorders efficiently. These have the antimicrobial and immune enhancing qualities (Rios and Recios 2005). Evidences of various spices like onion, garlic, mustard, red chili, turmeric, clove, cinnamon, saffron, curry leaves, fenugreek, ginger etc. are also there in the race. These too possess antioxidant characteristics (Tilak and Devasagayam, 2006). Many herbs have the potential for direct involvement with disease rectification. For example, plants like plantain (*Plantago major*), marigold (*Calendula officinalis*), nettle (*Urtica dioica*), marsh-mallow (*Althaea officinalis*), dill (*Anethum graveolens*), willow (*Salix alba*) can be used in diarrhoeal treatment in ruminants. In case of pigs, the seed of dock (*Rumex* spp.) boiled in water is very useful (Lans et al., 2007). *Nelumbo lucifera,* an aquatic plant is beneficial for treating disorders like skin disease, cough, inflammation, fever etc. (Mukherjee et al., 2010).

In cases of wound and skin diseases, medicinal plants' anti-inflammatory and antiseptic action are used in the healing procedures which enhance the forming of granular tissue and gradually accelerate the wounds epithelization. Yarrow (*Achillea millefolium*), marigold (*Calendula officinalis*) and aloe (*Aloe* sp.) are the experts of this field. For external several skin and mucous membrane injuries and even in burns, oil extract of Klamath (*Hypericum perforatum*) shows better performance (Davidović et al., 2012).

Herbs are also well-known for their liver protectant potentiality, work by posing impacts on microsomal system against liver dysfunction. Herbs having anti-tumour property include echinacea, aloe vera, tulsi, turmeric, satavar, garlic, aqueous extracts of black pepper and cardamom etc. Aromatherapy using Essential oils obtained from different parts of the plant proved quite effective in anticancer therapy (Boehm et al., 2012). Pipali plant, sitaphal, Kiwi fruit and extracts of Arjuna stem bark are strong antineoplastic agents (Patwardhan and Gautam 2005; Pettit et al., 1996; Sun et al., 2012). Kiwi fruit is specific in digestive system and mammary gland cancers (Lu et al., 2007). Polyphenols, vitamin C, carotene, fluoride, zinc, selenium, manganese, potassium, niacin, folic acid, theaflavins make green or black tea a tumour growth inhibitor (Mujtaba and Dou, 2012).

Likewise, ashwagandha (*Withania somnifera*) possesses immunomodulatory, hemopoietic and rejuvenating properties in addition to antitumor, anti-inflammatory and others. It appears to exert a positive influence on the endocrine, cardiopulmonary and central nervous systems. Ashwagandha also seems to exhibit a taming effect and works as a mild depressant (tranquilizer) on the CNS of monkeys, cats, dogs, albino rats and mice. Studies reveal that it can also potentiate barbiturate, ethanol and urethane induced hypnosis in mice (Mishra, 2000).

Similarly, turmeric plays a crucial role in rheumatoid arthritis, osteoarthritis, Alzheimer's disease. It is sound enough as HIV-1 and HIV-2 protease inhibitor, hepatoprotective, hypoglycaemic, hypolipidemic agent (Jain et al., 2007). Arjuna also inhibits HIV protease (Pettit et al. 1996). Giloy (*Tinospora cordifolia*) exhibits antiulcer, antidiabetic, anti-inflammatory, anti-cancer, antiallergic and anti-AIDS activities (Sarangi and Soni, 2013). Amla is utilized in arthritis, helps reduce inflammation and edema (Baliga and Dsouza, 2011; Ganju et al., 2003). Ethanol extract of ginger is bactericidal in nature, specifically for Gram positive bacteria (Alzoreky and Nakahara, 2003) whereas onion helps in food poisoning, diarrhoea, dysentery, loss of appetite. It acts tactfully against internal parasites and FMD, increases CD4 and total WBC counts and lifts up immunity (Mahima et al., 2012). Thus, a range of diseases from mild to fatal can be desensitized easily by the administration of various assembly of herbal inputs.

7. Physiological Benefits of Medicinal Herbs

Like diseases, medicinal plants promote the health and growth factors by improving physiological and immunological functions of the body. Thus, providing more sustainability in a

long run. These are profound in immune intensifying activities. *Coriolus versicolor* extracts has unique influence when used as an adjuvant (Ng, 1998). Polysaccharides from Astragalus, Isatis and Achyranthes roots and Chinese Yam cause marked improvement in antibody titre of vaccinated chicken (Hashemi and Davoodi, 2012). Such diverse immunoactive plant polysaccharides can activate neutrophils and macrophages for the secretion of cytokines, eicosanoids and enzyme like pro-inflammatory mediators (Davidović et al., 2012).

In a study, it was concluded that caraway (*Carum carvi*) and garlic can be successfully supplemented to growing male buffalo for better nutrient digestibility, performance, rumen fermentation and metabolic status (Afzalani et al., 2015). Garlic seems to stimulate immune function, enhances foreign compound detoxification, restores physical strength and provides resistance to various stresses (Amagase et al., 2001). Cysteine sulfoxides is the primary sulphur containing constituents in intact garlic (Lancaster and Shaw, 1989). Also, a whole garlic includes steroidal glycosides, lectins, prostaglandins, fructan, pectin, essential oil, adenosine, vitamins B1, B2, B6, C and E, biotin, nicotinic acid, fatty acids, glycolipids, phospholipids, anthocyanins, flavonoids, phenolics and amino acids, which make the garlic a winner (Fenwick and Hanley, 1985; Kaku et al., 1992; Matsuura et al., 1988). Caraway seed is preferred in meat, food and distillery industries for its pleasant flavour and intense taste. Moreover, its antibacterial and fungicidal properties are helpful both for human and veterinary medicine (Sedlakova et al., 2001). Various works have been done by multiple researchers for the improvement in animal management using different medicinal herbs and came up with fruitful results. A few of these outcomes are listed below (Table 1).

It has been found that introduction of medicinal plant in starter feed improves the performance and immune system of calves with reduction of their weaning age (Seifzadeh et al., 2016). On the other hand, stimulation of cytokines, phagocytosis and antigen presenting ability of macrophages are observed in neem extracts administration (Thatte and Dhanukar, 1997). Neem also fuels the production of IL-1, IFNγ and TNFα Th1 type of response as well as surges antibody titre against new castle's disease antigen in broiler (Renu et al., 2003). Giloy enhances haemopoietic growth factor, IL-3, GSH and Vitamin C and kindles RE system, bone marrow cellularity and stem cell proliferation (Prince et al., 2004). Amla boosts IL-2 and IFNγ productions, NK cell activity and antibody dependent cellular cytotoxicity (ADCC) and hinders apoptosis whereas aloe vera is capable of releasing IL-1, IL-6 and TNF-α and can selectively stimulates cytokines and activates lymphocytes (Egger et al., 1996). Tulsi having anti-oxidative property (Gupta et al., 2002), also intensifies IFNγ, IL-4, T-helper cells, NK cells (Mondal et al., 2011) which in turn increase neutrophil and lymphocyte count, phagocytic activity and phagocytic index. Oil from tulsi facilitates GABA pathway that helps modulating both humoral and cell mediated immunity (Mediratta et al., 2002). Garlic reduces IL-1, IL-6, IL-8 and TNF but rouses IL-10 (Spelman et al., 2006) and coriander increases IFNγ secretion and peripheral blood mononuclear cells (Cherng et al., 2008). Turmeric is considered as blood purifier, immunostimulant and have anti-oxidant activity (Devasagayam et al., 2001). Clove oil controls immune response by augmenting humoral immunity and reducing cell mediated immunity (Halder et al., 2011).

Table 1: Contribution of medicinal herbs in various aspects

Herbal Agents	Contribution	Beneficiaries	Source
Fenugreek, Fenugreek + Giloy	Lowers Total Cholesterol and Low-density lipoproteins (LDL) levels	Jersey crossbred lactating cows	Sharma et al. 2017
Aloe vera gel	Improves feed efficiency	Broilers	Sinurat et al., 2003
Garlic powder	Improves nutrient digestibility and growth performance	Growing lambs	El-Naggar and Ibrahim, 2018
Neem leaf extract	Immuno-potentiating effect	Broiler chickens	Renu et al., 2003
Giloy extract	Improves growth performance during bacterial enteritis	Broiler chickens	Kishwar et al., 2004
Ashwagandha extract	Improves feed intake, body weight gain, haematological profile and immunological status	Broiler chicks	Mushtaq et al., 2011
Ashwagandha root powder	Prevents Cd induced oxidative stress	Chickens	Bharavi et al., 2010
Neem extract	Increases immunity in IBD and antiviral activity against duck plague virus	Poultry	Xu et al., 2012

8. Conclusion

Herbs are multi-purpose medicinal agents and undoubtedly better alternatives to conventional chemotherapy. Evidences of their fruitful therapies can be received from the ancient antique civilizations. Though, several limitations exist thereby, lessons from these should be acknowledged generously.

Otherwise, the growth curve may indulge a decline. To support their therapeutic uses, more clinical trials can be conducted. Individual herb needs to emphasize more for effective results. And relevantly, implementation of multiple approaches with 'integrated knowledge-technology' becomes necessary for clinical successes.

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