

PLANT USAGE IN PROTECTING THE FARM ANIMAL HEALTH

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Review paper

Abstract: Phytotherapy, as form of traditional and conventional veterinary medicine, includes curing, alleviation and prevention the onset of diseases in animals based on natural medicinal raw materials and folk remedies made from plants. In animal health care, the use of medicinal and other plants as supporting therapy, in preventive purposes or as a complete therapy has a large potential regardless whether it is the question of individual or combined plant medicinal preparations which act synergistically. Phytotherapy is very intensively used in prophylactic purposes and with the aim of treatment of milder forms of diseases, chronic diseases and recurrent infections as well as in organic livestock production. Extracts and preparations from different plants are used with the aim of intensifying the activity of immune system and stimulations some functions of organism. The great number of herb metabolites shows antimicrobial and antiparasitic activity and gives the positive effects in the treatment of ectoparasitoses and endoparasitoses. This research paper gives a review of the plants most frequently used in ethnoveterinary medicine for health purposes of farm animals.

Key words: plants, health care, farm animals.

Introduction

In veterinary medicine, with the aim of preventing and treating diseases, various types of therapies are employed, such as traditional, folk ethnoveterinary therapy, allopathic or conventional, homeopathic, alternative and among them phytotherapy, as a mode of a traditional and conventional medicine. Conventional veterinary and ethnoveterinary medicine, even by taking into account their heterogeneity, must act jointly to realize their shared goal which is the preservation of health and welfare of animals. Traditional, folk veterinary medicine or ethnoveterinary medicine is being defined as a mode of identifying, use and integration of many local knowledges, related skills and custom procedures created by people for purpose of preserving health and welfare of animals (*Köhler-*

Rollefson and Bräunig, 1998). Ethnoveterinary medicine means prevention and curing of diseases by plants (phytotherapy), bee products (apitherapy), milk and dairy products, clay, rabbit fat and swine lard, as well as manual removing of *Ixodidae* from the body of animals and use of fly larvae in the cleaning of suppurated wounds. By lighting the fire on pasture and rubbing the parts of some plants and ashes into the animal skin a repellent action against insects, the carriers of some diseases, is obtained (*Kudi, 2003*).

Phytotherapy, as form of traditional and conventional veterinary medicine, is one of the oldest and the most widely spread systems of therapy. The skill of treatment using medicinal plants was developed by all nations where in conformity with the region in which they lived they had learned to use available plants. Phytotherapy is based on traditional use of medicinal and other plants on the basis of long-term human empiricism regardless whether the medicinal properties of a certain plant were scientifically confirmed or not. Nowadays however, by performing chemical, pharmacological and toxicological research for a great number, but not for all phytopreparations, the content of medicinal matters has been defined accurately and approved clinically for their healing properties.

The knowledge about plants and their use in nutrition and prophylactic and therapeutical purposes in humans and animals goes back far into the history what is evidenced by various sources in the form of written records, preserved monuments and original vegetable drugs. By using plants in the nutrition the man had noticed their medicinal properties. First written records on medicinal drugs and their application in prevention and therapy of human and animal diseases were found during tomb excavations and on the walls of the temples of ancient civilisations. African, American, Arabian, Egyptian, European, Asian, Sumer and other cultures through the centuries had developed their own ways of application of medicinal and other plants in health care. Babilon-Asiryan cuneiform script on pharmacotherapy describes a great number of vegetable drugs used for medicinal purposes (belladonna, thorn apple, flax, cypress, cedarwood, fig tree, onion, etc.). Ancient Egyptian medicine was acquainted with different drugs and other useful plants (anise, senna, mulberry tree, sunflower, henbane, saffron, thyme, cinnamon and other), and knowledges about their action had been written on medical papyruses. Ajuurveda, collection of veda or "knowledge" of ancient India contains the descriptions of plants and their action, as well as principles of diagnoses and treatment of diseases. According to the memoirs of Pliny the Senior, the Romans had prepared the potion from stinking hellebore to eject the poison from the body, while the mistletoe which grows on the oak had been attributed to the greatest healing power. Old Slavs had known and used a great number of plants for treatment: against fever they had used absinthe and centaury, as emetic means they had used stinking hellebore and wild ginger, as diuretics parsley and celery, and garlic as antihelmintic (*Kišgeci, 2002; Kuštrak, 2005*).

By the end of the eighteenth and beginning of nineteenth century almost nothing was known about chemical composition of plants. Plants, their skin, seed, fruit, leaves and other organs, in prophylaxis and treatment of many diseases of different etiology had been used based on long-term experience. By modern scientific research an active healing action was confirmed for a great number of plants used in traditional medicine. By the end of the last century, the four fifths of human population in the world used phytotherapy and other forms of folk medicine with the aim of prevention and treatment of human and animal diseases (*Abelson, 1990; Alcorn, 1995*). The aim of this paper is to give a review of the plants most frequently used in ethnoveterinary medicine.

The role of plants in preserving health and welfare of animals

Medicinal herbs, along with some other herbs, are used both separately or as an additional therapy to conventional drugs which can, in this case, thanks to the action of active plant ingredients, be used in lower, safer doses. It is possible to direct curative effect of plants in a certain direction, to strengthen or alleviate their action by combining certain features of some plants and their preparations. In phytotherapy whole plants are used, then their parts – drugs with structure of s. organized drug (overground and underground plant organs) and drugs without structure s. non-cell drug (milk juice, ether oil, wax, mucus, balsam), ingredients and preparations. Teas, decoctions, extracts (watery, alcohol, watery-alcohol, oily), tinctures, macerations, solutions, syrups, bathing soaps, creams and lotions are prepared from medicinal and other plants. In veterinary medicine, the use of plants in a certain form is somewhat limited because of the absence of cooperation with the patient on one hand while on the other the forms intended exclusively to animals are not available currently.

Active principles of plants belong to the group of secondary metabolites created by metabolic modifications of products of primary metabolism (carbohydrates, aminoacids and fatty acids). Secondary plant metabolites are of very versatile chemical composition and different pharmacological action and they include heterosides, alcaloides, saponosides, terpenoides, tannins, flavonoides. Taxonomically related plants mostly produce chemically similar, but not the same metabolites, therefore their pharmacological effects are similar, but they cannot replace one another in prevention and treatment of human and animal diseases. The plants are used in the prevention and treatment a great number diseases of different body systems (cardiovascular, gastrointestinal and hepatic, nervous, musculoskeletal, urogenital and respiratory system, skin and mucous membranes).

The role of plants in strengthening the organism resistance

The most serious attention in animal health care is devoted to prevention of diseases based, among other things, on raising animals in accordance with their demands and needs in order to achieve maximum resistance towards diseases and protection against infections. The effects of application of vegetable preparations are mostly directed towards stimulating some organism functions and enhancing their defensive abilities. The use of herbal extracts and preparations with the aim of intensifying the activity of immune system and stimulations some functions of organism is important, especially in the fact that in all European Union countries, from the beginning of 2006, the use of antibiotics for prophylactic and stimulatory purposes in all fodder mixtures was forbidden. According to the *Regulation on organic livestock production methods (2002)*, phytotherapeutics (plant extracts, essence) and homeopathic products (vegetable, animal and mineral substances) have advantage over synthetic-chemical veterinary preparations in the health care of animals in case they ensure positive therapeutic effects in animals. Different immunoactive plant polysaccharides can activate neutrophils and macrophages and enhance secretion of pro-inflammatory mediators such as cytokines, eicosanoids and enzyme. Vegetable drugs having immunostimulating action are horsetail (*Equisetum arvense* L., Equisetaceae) (Štajner et al., 2009), ehinacea (*Echinacea angustifolia* DC, *Echinacea pallida* Nutt. and *Echinacea purpurea* L., Asteraceae) (Goel et al., 2002), mistletoe (*Viscum album* L., Loranthaceae) (Sengul et al., 2009), stinking hellebore (*Helleborus* L.) (Bogdan et al., 1989; Davidović et al., 2008) and other.

Although it belongs to poisonous plants a stinking hellebore (*Helleborus* L., Ranunculaceae) is used in ethnoveterinary medicine for cattle "herbal treatment" in Pek, Zvižd, Jarmenovci and Vojvodina (Đurić, 1985), in Macedonia (Stojkovski et al., 1999) and in Romania (Bogdan et al., 1990a). Unspecific irritable therapy farms animals by a procedure of transcutaneous implantation of stinking hellebore rhizome in the ear of sheep and pigs, cattle necklace and horses chest skin is conducted with the aim of protection from diseases and parasites, acute stages of chronic illness, diminished appetite and to induce immuno response. In folk, traditional medicine and ethnoveterinary medicine an underground organs of stinking hellebore are used as purgative, emetical, diuretic, intoxicating and irritating agent, and as a remedy for the heart (cardiotonic) and nerves (Kušan, 1956). The all kind of stinking hellebore are used for treatment of gargets by sheeps and puts in the drinking water if the sheep or cattle bounces the food. Dependent from the dose, way applications and process on which influence, rhizome and root extract of *Helleborus* sp. can show immunostimulatory or immunosuppressive effects. It can be supposed that immunostimulatory effects of the rhizome and root extract of *Helleborus* sp. were based on at least three

mechanisms: leukocytosis, granulocytosis and increase of macrophage and neutrophile phagocytosis.

Subcutaneous, intraperitoneal and intramuscular application of different concentrations of the extract of rhizome and root of *Helleborus odorus* Walds. et Kit. (HE 5 mg/100 g BW, 10 mg/100 g BW or 20 mg/100 g BW) to the Wistar strain rats have led to expressed leukocytosis and neutrophilia, that is, activation of rapid, non-specific defensive mechanisms (Davidović et al., 2006a,b, 2007a, 2010a,b) and poor haemolysis (Davidović et al., 2007b, 2010c). By the group of rats to which 10 mg/100 g BW HE was applied, highest average value of total count of leukocytes which has brought out $13,37 \pm 1,34 \times 10^9/L$ was recorded. Individuals of all trial groups had a greater count of leukocytes than the control group of rats. The highest mean value in the count of neutrophil granulocytes was found in the group of rats which 10mg/100g BW HE was applied, and was $6.43 \pm 0.80 \times 10^9/L$. This value is significantly higher in relation to the count of neutrophil granulocytes in the blood of rats of control group ($P < 0.001$) and trial groups treated with 5mg/100g BW HE ($P < 0.01$) and 20mg/100g BW HE ($P < 0.05$). Our results correspond to the results of greater number of authors who also recorded a pronounced leukocytosis and increased in count and percent of neutrophil granulocytes in blood of animals treated by hellebore extract. Bogdan et al. (1989, 1990a,b, 1993) determined a leukocytosis and neutrophilia 24h, 48h, 96h and 144h after application of the extract of hellebore or after transcutaneous implantation of rhizome of *Helleborus* sp. in cattle necklace, horses chest skin and sheep and pigs auricle. Tosevski et al. (1999, 2004) recorded, after the application of extract of *Helleborus odorus* W. et K. to piglets in the age of 35 days and 52 days, a significant increase in the count of total leukocytes and neutrophil granulocytes in blood after 7, 14 and 21 days. A determined increase in the count of total leukocytes and neutrophil granulocytes in our trial is similar to the increase of this values stated by Milanović et al. (2004).

A research on the degree of phagocytosis of residing (non-stimulated) peritoneal macrophages, by determining the level of production of H_2O_2 and neutrophil granulocytes by determining the phagocyte index, was conducted 24h after the intramuscular application of sterile physiological solution (PS) to a control group of rats and application of extract of rhizome and root of *Helleborus odorus* Walds. et Kit. (HE 10 mg/100 g B.W.) to a trial group (Davidović et al., 2010a). The average values as regards the concentration of H_2O_2 (nM/mg proteins) after the stimulation of macrophages by different concentrations of phorbol myristate acetate (PMA) was in all cases a statistically significant higher ($P < 0.05$) in the group of rats to which HE was applied in relation to a control group of rats. A statistically significantly higher percent of neutrophil granulocytes containing at least 3 granules of latex particles in rats to which HE was applied (30.04 ± 6.29) in relation to the rats in control group (23.76 ± 2.89) was recorded being at the level of significance of $P < 0.05$. Results obtained on rats correspond to the results of

Bogdan et al. (1989, 1990a). These authors say that the index of phagocytosis in sheep was 0-21 before the implantation of rhizome of *Helleborus* L. and 0-34 after the implantation.

Antimicrobial activity of plants

Over last decades a usual practice in livestock production was the use of antibiotics as growth promoters which were applied in doses smaller than therapeutical. Subtherapeutic doses of antibiotics destroy a great number of pathogens and promote the growth of useful microflora. Obtained effect is to prevent production of bacterial toxins with simultaneous reduction of food consumption and immuno stress because more nutritive ingredients are directed towards growth and production instead of to mechanisms for strenghtening the resistance of organism. Recently the efforts of researchers have been directed towards finding alternatives solutions for the use of antibiotics (*Mellor, 2000*). Today, several groups of these additives are in use, and most often probiotics, prebiotics, enzymes, acidifiers, antioxidants and phytoгене additives (*Perić et al., 2009*). By using nutritive supplements it is possible to induce food digestion (hydrolitical enzymes) and prevent the development of pathogenic microorganisms (plants extracts, organic acids, useful microorganisms) (*Đorđević et al., 2006; Davidović et al., 2007c*). Thus the advantage of herbal preparations containing active ingredients with antimicrobial effect is reflected in the fact that they do not induce resistance of pathogenic microorganisms, do not leave residues in the food, they are completely non-toxic and can be used in more than one different indications. In this way the quality of products (meat, milk, eggs) can also be improved. Aromatic herbs rich in ether oils have antimicrobial action, therefore following plants are used in ethnoveterinary medicine as natural disinfectants and antiseptics: chamomile (*Matricaria chamomilla* L., Asteraceae), sweet basil (*Ocimum basilicum* L., Lamiaceae), lemon balm (*Melissa officinalis* L., Lamiaceae), yarrow (*Achillea millefolium* L., Asteraceae). A significant bactericidal and fungicidal activity is displayed also by *Chenopodium botrys* L., Chenopodiaceae (*Maksimović et al., 2005*) and *Ambrosia artemisiifolia* L., Asteraceae (*Chalchat et al., 2004*). The addition of prebiotic and herb mixture (resemmary, thyme, sweet basil, oregano and cinnamon) to the diet of Pekin ducklings contributed to reduction of pathogenic intestinal microorganisms (*Gerzilov et al., 2011*).

The effect of plants in the treatment of ectoparasitoses and endoparasitoses

In the treatment of ectoparasitoses and endoparasitoses a positive effect of a great number of plant species which used a singular or combined has been observed.

White mugwort (*Artemisia absinthium* L., Asteraceae) and black mugwort (*Artemisia vulgaris* L., Asteraceae) had for centuries been used as anthelmintics (especially against oval and cylindrical worms) and in the treatment of animals infected by blood parasites (*Trypanosoma*, *Plasmodium* spp.), so by rubbing the ground fresh leaves mixed with lard into the cattle skin a repellent action on flies is achieved. Today these plants are used also in various disturbances of gastrointestinal tract, diminished secretion of digestive enzymes, disturbed creation and secretion of bile and for strengthening of the organism. *Artemisia absinthium* L. is administered as food supplement to improve appetite and food digestion while boiled overground parts of this plant help young calves to digest cow's milk (Guarrera, 1981). Because of its exceptionally strong action even small doses can cause coma or death in adult animals so dried plant material is used instead of ether oil. Decoction of the rhizome of genuine brachen s. Male Fern (*Dryopteris filix-mas* L., Aspidiaceae) is one of the strongest natural drugs against tapeworms (*Taenia saginata*, *Taenia solium*) and flukes (*Fasciola hepatica*). Filicin and filmarone in oil act toxically on worms, while oleorescin paralyzes their musculature and prevents parasites adhesion on bowels mucous membrane (Jarić et al., 2007). In some parts of our country a stinking hellebore (*Helleborus* L., Ranunculaceae) cooked together with hellebore (*Veratrum album* L., Liliaceae) and tobacco (*Nicotiana tabacum* L., Solanaceae) is used in eradication of cattle lice infestation and mange.

Treatment of gastrointestinal system by plants

In the treatment of diseases of digestive tract a great number of plants is used whose active principles include bitter substances (many Asteraceae), glucosides (for example salicine in *Salix alba* L., Salicaceae) essential oils and jelly (*Linum usitatissimum* L., Linaceae, *Malva sylvestris*, Malvaceae) (Viegi et al., 2003). In ethnoveterinary medicine the treatment of diarrhoea in ruminants means the use of following plants: plantain (*Plantago major* L., Plantaginaceae), marigold (*Calendula officinalis* L., Asteraceae), nettle (*Urtica dioica* L., Urticaceae), marsh mallow (*Althaea officinalis* L., Malvaceae), dill (*Anethum graveolens* L., Apiaceae), willow (*Salix alba* L., Salicaceae) (Lans et al., 2007). The seed of dock (*Rumex* sp., Polygonaceae) boiled in water is used for treatment of diarrhoea in pigs. Overground parts of flowered Klamath weed (*Hypericum perforatum* L.,

Hypericaceae) boiled in water are administered to cattle and sheep through drinking water if swelling occurs (Jarić et al., 2007).

Herbal remedies for wound and skin diseases

The juice obtained by crushing the sambucus leaves (*Sambucus ebulus* L., Sambucaceae) is applied directly at the place of snake bite or a bee sting, and thanks to its antiinflammatory action the root and leaf of this plant are used in the treatment of burns, inflammations, oedema, eczema and urticaria (Ebrahimzadeh et al., 2006). In some regions the place of snake bite is being thrashed by a dog rose branch (*Rosa canina* L., Rosaceae) in order to draw the poison out and infection of wounds after the bite of a wolf in cows and sheep is prevented by the compress made of cooked hellebore rhizome (*Veratrum album* L., Liliaceae) (Guarrera, 1994). In ethnoveterinary medicine the following plants having antiinflammatory and antiseptic action are used in healing of the wounds and they help forming of granular tissue and accelerate the wounds epithelization: yarrow (*Achillea millefolium* L., Asteraceae), marigold (*Calendula officinalis* L., Asteraceae) and aloe (*Aloe* sp., Liliaceae). The oily extract of Klamath weed (*Hypericum perforatum* L., Hypericaceae) is used externally in various skin and mucous membrane injuries and wounds as well as in burns.

Conclusion

This research paper gives a review of the plants most frequently used in ethnoveterinary medicine, but the number of plant species which are successfully used in the prevention and treatment of animal diseases is far greater. Phytotherapy is one of the oldest and the most widely spread systems of therapy based on the use of plants regardless whether the healing properties of certain plants have been scientifically confirmed or not. Scientific findings on active ingredients, mechanisms of action and application of certain vegetable preparations are still incomplete, therefore it is necessary to intensify phytochemical, physiological and phytofarmacological research on insufficiently studied or less known plant species.

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Primena biljaka u cilju zaštite zdravlja domaćih životinja

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Rezime

Fitoterapija, kao oblik konvencionalne i tradicionalne veterinarske medicine, podrazumeva lečenje, ublažavanje i sprečavanje nastanka bolesti životinja primenom prirodnih lekovitih sirovina i narodnih lekova pripremljenih od biljaka. U zdravstvenoj zaštiti životinja, upotreba lekovitog i drugog bilja kao potporne terapije, u preventivne svrhe ili kao potpune terapije ima veliki potencijal, bilo da se radi o pojedinačnim ili o kombinovanim biljnim lekovitim sredstvima koja deluju sinergistički. Veoma intenzivno se primenjuje u profilaktičke svrhe i u cilju lečenja blažih oblika bolesti, hroničnih bolesti i rekurentnih infekcija, kao i u organskoj stočarskoj proizvodnji. Biljni ekstrakti i preparati se primenjuju u cilju jačanja aktivnosti imunskog sistema i stimulisanja pojedinih funkcija organizma. Veliki broj biljnih metabolita ispoljava antibakterijsko i antiparazitarno delovanje i daje pozitivan efekat u tretmanu ektoparazitoza i endoparazitoza. Ovaj rad predstavlja pregled najčešće korišćenih biljnih vrsta u etnoveterinarskoj medicini u cilju zaštite zdravlja domaćih životinja.

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