



Supplementation of Herbs and Herbal Plants in Feed for Optimum and Quality Animal Production

Bharti Yadav¹, Praveen Kumar Agrawal², Vikas Galav³

Department of Veterinary Pathology

Post Graduate Institute of Veterinary Education and Research (PGIVER), Jaipur

¹ PG Scholar, Department of Animal Nutrition, PGIVER, Jaipur

² PG Scholar, Department of Animal Nutrition, PGIVER, Jaipur

³ Assistant Professor, Department of Veterinary Pathology, PGIVER, Jaipur

<https://doi.org/10.5281/zenodo.10750881>

Herbal plant and their ether extract, are being used in Ayurveda since long time even before, the world knew the allopathic medication. These herbs are small, flowering, non woody bushy plants which are valued for their medicinal properties, flavor, scent, or the like. These include a wide variety of herbs, spices, condiments, feed enzymes, flavor improvers, organic acids, coloring, detoxicants, preservatives, antioxidants, herbs. Bioactive substances that occur in herbs (alkaloids, glycosides, tannins, essential oils, phenolic compounds and others) affect the animal bodies in a specific way: they have antibacterial properties, improve the functioning of the immune system, regulate feed intake and appetite in animals by improving the flavor, and regulate the functioning of the digestive system, inhibit or enhance metabolism, and also shape the sensory and dietary properties of the animal products.

Livestock farmers are generally faced with the challenge of improving livestock performance in order to ensure more net returns. A lot of research and production strategies have been employed, including the use of antibiotics to achieve this aim. Although antibiotics achieved good performance, their potential side effects became a real public health concern globally and eventually led to the ban of the products especially in the western world. This triggered an explosion of interest in the use of herbs and spices and their products as supplements in animal rations. Some studies reported that up to one third of all commercial swine and chicken rations in Europe now use mixtures of herbs and spices to accelerate growth and maintain health. They have been reported to possess antimicrobial, ant oxidative, anti-inflammatory and immuno-modulatory properties. Herbs and spices fall into the class of feed additives currently referred to as “Phytogenics”. They are strongly being considered as addition to the set of non-antibiotic growth promoters, such as organic acids and probiotics which are already well established in animal nutrition. Their usefulness lies in some chemical substances (bioactive molecules) that produce definite physiological actions in the body of the animals. The most important bioactive constituents include alkaloids, tannins, flavonoids, saponins and phenolic compounds. Some of the useful herbs and spices are indigenous to INDIA and include turmeric (*curcuma longa* l.), coriander (*corianderum sativum*), black



pepper (*piper nigrum*), fennel (*foeniculum vulgare*) and many more. They have been reported to enhance the performance of livestock animals.

Use of herbs in animals gaining much importance in animal production due to ban on use of certain antibiotic, harmful residual effects and cost effectiveness. A number of feed additives like prebiotics, probiotics, organic acids and plant extracts have been found to have beneficial effects on production. These medical herbs improve digestibility, antimicrobial, anti-inflammatory and immune-stimulant activity must be exploited in feeding of animals along with safeguarding human health.

Mode of action

The mode of action of herbs and plant extracts has not been fully elucidated. However, there are certain potential mechanisms by which they may improve performance. The diverse activities of herbs and other feed additives can have considerable importance during the growth phase of animals. In the very young animal, nutrient digestion and metabolism are not yet fully functional. Furthermore, the immune system and a stable digestive tract micro flora (eubiosis) must be established, for which regular feed intake is compulsory. After this critical period, digestive processes can be optimized and adapted to the available feedstuffs. In these later stages of growth, factors related to product quality (feed quality and meat, milk or egg quality) play a major role. Herbs and spices can protect the feed against oxidative deterioration during storage. This is a widely used practice in food animals and processed animal origin food industry. The commonly used h Herbs and their mixture can affect the animal by improved digestive tract function, by anti-inflammatory, anti-oxidative and anti-microbial effects and influence different physiological functions.

Improved digestive tract functions

Herbs enhance and add flavors in animal feed and can therefore influence eating patterns, secretion of digestive fluids and total feed intake. The primary site of activity is the digestive tract. Due to the wide variety of active components, different herbs and spices affect digestion processes differently. Herbs may exert multiple functions in the animal body (Hernandez et al. 2004). Most of them act as sialagogues and stimulate the secretion of saliva, which makes swallowing easier. The extracts from *Salvia officinalis*, *Thymus vulgaris* and *Rosmarinus officinalis* and the blend of carvacrol, cinnamaldehyde and capsaicin improved feed digestibility in broilers. They also observed the positive effects of plant extracts on nutrient digestibility to the appetite and digestion-stimulating properties and antimicrobial effects. Increased feed intake and digestive secretions are also observed in animals given phytobiotic supplemented feed. *Curcuma longum*, *Zingiber officinale*, *Foeniculum vulgare*, *Mentha piperita*, *Allium sepa*, *Trigonella foenumgraecum*, and *Cuminum cyminum* enhance the synthesis of bile acids in the liver and their excretion in bile, which is necessary for the digestion and absorption of lipids. Most of the herbs and spices stimulate the function of pancreatic enzymes (lipases, amylases and proteases); some also increase the activity of digestive enzymes of gastric mucosa. Besides the effect on bile synthesis, secretion and enzyme activity, herbs, spices and their combinations accelerate the digestion and shorten the time of feed/food passage through the digestive tract. Herbs or the phytochemicals can selectively influence the intestinal microflora by either antimicrobial activity or by favorably promoting eubiosis of



the microflora resulting in better nutrient utilization and absorption, or stimulation of the immune system. Lastly, herbs can contribute to nutrient requirements, stimulate the endocrine system and affect intermediate nutrient metabolism. Phytochemical substances from certain herbs, spices, and their extracts have also been shown to have pharmacologic actions within the digestive tract, as evidenced by their relaxant and spasmolytic effects.

Anti-oxidative effects

There is a need to assess the antioxidant status of feed available and antioxidant status of animals to combat different stress contracted by animals in response to get maximum benefit whether in the form of milk, meat or wool. In physiological conditions, mammals constantly produce reactive oxygen species (ROS). Low concentrations of ROS are essential for several physiological processes, including protein phosphorylation, transcription factors activation, cell differentiation, apoptosis, oocyte maturation, steroidogenesis, cell immunity and cellular defense against microorganisms. However, the cellular concentration of ROS, is to be disposed by the organism. Oxidative stress refers to a lack of balance between production of ROS and the level of antioxidants, which results in oxidative alteration of biological macromolecules such as lipids, proteins and nucleic acids. Domestic animals are frequently exposed to oxidative stress, especially in intensive breeding systems. Oxidative stress is responsible for numerous disease processes in animals, including sepsis, mastitis, enteritis, and pneumonia, respiratory and joint diseases. Main molecules responsible for the antioxidant properties of herbs and spices are phenolic substances (flavonoids, hydrolysable tannins, proanthocyanidins, and phenolic acids phenolic terpenes) and some vitamins (A, E and C). Frequently used herbs rich in phenolic are *Rosmarinus officinalis*, *Thymus vulgaris*, *Origanum vulgare*, *Salvia officinalis*, *Camellia sinensis*, *Taraxacum officinale*, and Ginkgo. Many active components of herbs and spices can prevent lipid peroxidation through quenching free radicals or through activation of antioxidant enzymes like superoxide dismutase, catalase, and glutathione peroxidase and glutathione reductase. These antioxidants function within a synergistic network of antioxidant compounds, both exogenous and endogenous to the body. A surplus of exogenous antioxidants has only a limited capacity to defend the body from deleterious ROS. The ultimate goal of any antioxidant supplement should be to up-regulate the entire system which is naturally regulated by a number of pathways, many of which are not well understood. Vitamin E, a synthetic antioxidant is commonly used in animal nutrition, but its bio efficiency is limited when n-3 PUFA intake is increased. Feeding trials conducted with poultry showed that plant extracts obtained from *Origanum vulgare* prevented lipoperoxidation in muscle tissues and may be complementary to Vitamin E. Chinese herbal mixtures in a corn, corn silage and alfalfa hay-based diet increased the digestive enzymes activities in post-ruminal digestive tract and enhanced antioxidant status of serum in a formulation dependent manner.

Anti-microbial effect

The anti-microbial properties of plant-derived substances have been well known for centuries. This property is mainly attributed to the essential oils of the plants. Several in-vitro experiments have proved certain plant extract exhibit strong antimicrobial activity against Gram negative and Gram-positive bacteria. *Origanum vulgare* and *Thymus vulgaris* contain the monoterpenes, carvacrol and thymol have



demonstrated high efficacy in-vitro against several pathogens found in the intestinal tract. Garlic (*Allium sativum L.*) is considered as a good antimicrobial agent. The thiosulfate (allicin) compounds of garlic react with biological molecules having free SH groups to influence or inhibit growth of bacteria. The breakdown products of allicin have the ability to cross cell membranes and combine with sulphur containing molecular groups in amino acids and proteins, including bacterial enzymes, thus, interfering with bacterial cell metabolism. Animal cells contain glutathione, a sulphur containing amino acid that combines with the allicin derivative and therefore, are not poisoned by allicin derivatives thus, and preventing cell damage. The anti-bacterial properties of *Allium sativum* were confirmed against *Escherichia coli*, *Staphylococcus aureus* and *Salmonella* spp. that *Allium sativum* extract have potential for prevention or control of infections caused by enteric pathogens, such as *Escherichia coli*, *Enterobacter cloacae*, *Enterococcus faecalis* and *Citrobacter fundi*. *Allium sativum* also contains active substances which suppress the action of fungi and viruses. Volatile oil from thyme (*Thymus vulgaris*) was assessed for antibacterial and antiviral activity as inhibitors of microbial growth. The mixture of *Thymus vulgaris*, *Cinnamomum zeylanicum* and *Origanum vulgare* extracts inhibited the growth of coliform bacteria. Phytogetic feed additives may be suitable replacements of antibiotics to improve animal health and growth performance naturally, particularly during the first few weeks post weaning. Clove oil has been demonstrated to have antimicrobial, choleric and insecticidal activities, and a relaxant effect on smooth muscle. In lemon grass, antibacterial, antioxidant, and antiseptic activities have been studied. Essential oils have long been recognized for their antimicrobial activity and they have gained much attention for their potential as alternatives to antibiotics in broiler chickens. Some studies with broilers demonstrated in vivo antimicrobial efficacy of essential oils against *Escherichia coli* and *Clostridium perfringens*. The exact anti-microbial mechanism of essential oils is poorly understood. However, it has been suggested that their lipophilic property and chemical structure can play a role. It was suggested that terpenoids and phenylpropanoids can penetrate the membranes of the bacteria and reach the inner part of the cell because of their lipophilicity.

Effect of herbs and herbal preparation on animal products

Feed and feed supplement have a direct positive or negative impact on quality of meat, milk and eggs. Plants produce a huge amount of secondary plant metabolites; some may be harmful to the animals other may not. Many phytochemicals such as saponins, essential oils, tannins and flavonoids from a wide range of plants have been identified, which have potential values for rumen manipulation and enhancing animal productivity as alternatives to chemical feed additives.

1. Milk production

Milk production is controlled by interplay of various hormones. Actually, milk production is a complex process involving physical and emotional factor and the interaction of multiple hormones, the most important of which is believed to be prolactin. With parturition and expulsion of placenta, progesterone level falls and full milk supply is initiated. Through interaction with hypothalamus and anterior pituitary, dopamine agonists inhibit, and dopamine antagonists increase prolactin secretion and thereby milk production (endocrine control). Thereafter, prolactin level gradually decreases but milk



supply is maintained or increased by local feedback mechanism (autocrine control). Therefore, an increase in prolactin level is needed to increase but not to maintain milk supply. Numerous herbs and their mixture are being used for centuries to enhance and sustain milk production in farm animals. *Asparagus recemosus*, *Leptadenia reticulata*, *Nigella sativa* are few herbs which are being used as galactagogues. Galactagogues are believed to assist in the initiation, maintenance, or augmentation of milk production. *Leptadenia reticulata* has been shown to produce significant galactopoietic response in goats, sheep, cows and buffaloes. It has been suggested that Galog, a herbal product, may stimulate milk production observed 30.1% increase in milk yield from Payapro, a herbal combination supplemented in cows observed an increase in milk yield and also an increase in the fat percentage of milk in dairy cows fed with Lectovet (a herbal combination). Galactin, a non-hormonal herbal preparation significantly enhanced milk the production in dairy cows and ultimately improved the dairy economy. Indigenous herbal preparations effectively restored the altered milk constituents and increased the milk production in cows with sub-clinical mastitis. Ruchamax (a mixture of several herbs) increases the salivary secretions, boosts the populations of friendly bacteria and protozoa, optimizes the digestive functions, and ultimately helps in the assimilation and metabolism of feeds. Herbal preparation not only increase the milk production, but also arrest decline phase giving a post peak slow but gradual decline that prolonged the lactation period. Overall, the percentage monetary gains from animals fed either Ruchamax or Payapro (a combination of more than 10 herbs) was found to be 50.37 % and 23.49%, higher respectively. *Ilex paraguarensis* supplementation sustained milk production in dairy cows (Celi et al. 2010). Milk flavor can be controlled by the use of herbs as a feed supplement for dairy cows. The dried herbs were fed to lactating dairy cows; the characteristic smell of cow milk was suppressed due to the transmission of components peculiar to such herbs into the cows' milk. An increase in milk flavor was observed with the supplementation of some herbal galactagogue.

2. Meat production and quality

Lipid oxidation occurs during processing and storage of meat and meat products is responsible for the loss of quality in meat due to microbiological deterioration. Products of lipid peroxidation adversely affect the color, flavor, texture and nutritive value of meat. Quality feed together with proper hygiene, potable water and management can ensure the production of nutritious animal products with desired organoleptic properties. Free radicals are not only destructive to the living cells but also reduce the quality of animal products through oxidation. Superoxide anion radical, one of the most destructive reactive oxygen species, is a matter of concern for the animal scientists as well as feed manufacturers to ensure the quality of product. Feeding of n-3 PUFA-enriched diets can improve animal fat. Therefore, new bio efficient antioxidants particularly natural antioxidants are a novel approach to respect consumer concerns on safety and toxicity. Plant extracts rich in polyphenols are good candidates, since they are easily obtained from natural sources and they efficiently prevent lipid oxidation in food products. In an investigation with (i.e., rats fed a PUFA-rich diet supplemented with 2 g of Isoflavone rich powder per kg of diet) was not inducing a reduction of plasma melondialdehyde. The genus *Mentha* is a rich source of polyphenolic compounds and hence could possess strong antioxidant properties. *Mentha* characterized by their volatile



oils that are of great economic importance, being used by the pharmaceutical, cosmetic, food, confectionery and liquor industries are now cultivated as industrial crops in several countries. Supplementation of turkeys with 200 mg/kg of oregano essential oil significantly decreased lipid peroxidation of cooked and fresh meat during refrigerated storage and also preserved the quality of chicken meat during frozen storage). Addition of vitamins C and E with the extracts from herbs and spices more effectively prevent lipid peroxidation. Some studies compared the carcass characteristics and meat quality of lambs grazed on low land and mountain pastures and showed that there were significant differences between the fat content and fatty acid composition, meat color, and meat flavor. Additionally they reported that meat from lambs raised on mountain pastures without any supplementary feeding or treatment is often considered to be of superior quality. This was because lambs on mountain pastures had access to plenty of miraculous herbs and wild shrubs and the meat is often tasty.

3. Herbs and egg quality

Herbs as a natural colorant are being used for decades in poultry feed. The colorants for increasing yolk color in laying hens or skin color in broilers in intensive production can be of natural (carotenoids) or synthetic origin. Maize and alfalfa are rich in carotenoids and used in poultry feed for energy and as colorant. Besides these, marigold, tagetes and red pepper are also used as natural colorant. The main yellow pigments in tagetes are zeaxanthin and lutein, while Cayenne pepper (red pepper) contains two important red pigments capsantin and capsorubin. Pigments obtained from *Calendula officinalis* and Cayenne pepper is very suitable as yolk colorants in organic farming. *Morus nigra* leaves can be a good natural colorant for layer feed. Studies conducted with layers suggested that supplementation of mulberry leaves in layer feed enhanced yolk color, egg quality, shelf life and antioxidant properties of egg. A yellow skin chicken is more in demand than a white skin chicken. The effectiveness of a particular natural source as a pigment for poultry products depends on the level and availability of the xanthophylls in the source as well as the chemical nature of the particular xanthophylls. Feeding of purified xanthophylls such as lutein, zeaxanthin, and cryptoxanthin was effective in pigmentation of broiler skin. In other studies, reported significantly increased skin yellowness in broilers by using saponified marigold concentrates in the diet.

4. Stability of animal products

The use of herbs and spices as antioxidants is not important only for the excellent health of the animals, but also for the oxidative stability of their products. The effect of oregano essential oil on oxidative stability of chicken and turkey meat was well studied. Supplementation of turkeys with 200 mg/kg of oregano essential oil significantly decreased lipid peroxidation of cooked and fresh meat during refrigerated storage. Essential oil of oregano also efficiently preserved the quality of chicken meat during frozen storage. Extracts from herbs and spices in combination with vitamins C and E even more effectively prevent lipid peroxidation in tissues of chickens and turkeys. Goats feed was supplemented with *Andrographis paniculata*, turmeric and vitamin E to compare their antioxidant contents in meat and it was found that meat from supplemented goats had higher antioxidant activities and better sensory qualities. The antioxidative potential and quality of the breast meat of broiler chickens, fed a dietary medicinal herb



extract mix of (MHEM, consisting of *Morus nigra* leaf, Japanese honeysuckle, and goldthread at a ratio of 48.5:48.5:3.0) and observed that MHEM did not affect proximate composition of the breast meat, but the phenols content of the breast meats was twice in supplemented group. They concluded that this herbal mixture increased the antioxidant potential and overall preference of breast meat during cold storage. Feeding studies conducted with poultry showed that plant extracts obtained from oregano prevented lipoperoxidation in muscle tissues and may be complementary to vitamin E.

5. Immunostimulation

The immune system generally benefits from the herbs and spices rich in flavonoids, vitamin C and carotenoids. The plants containing molecules which possess immunostimulatory properties are *Echinacea purpurea*, *Glycyrrhiza glabra*, *Allium sativum* and *Uvacaria tomentosa*. These plants can improve the activity of lymphocytes, macrophages and NK cells; they increase phagocytosis or stimulate the interferon synthesis. *Cinnamomum zeylanicum* essential oil showed stimulatory effects on macrophages, which play an important role in the initiation and regulation of the immune response constitute the body's primary line of defense against infections. Extracts from herbs and spices help to prevent and alleviate different kinds of health problems without any side effects and leaving harmful residues in animal body. Herbs and spices are effective in treatment of endometritis (inflammation of the endometrium) in cows. The effect of extracts of garlic (*Allium sativum*, L), eucalypt (*Eucalyptus globulus*, Labill.) and *Gnaphalium onoideum* studied on acute endometritis of Holstein cows. The most effective of all extracts was the *Allium sativum* extract, however, also eucalypt worked beneficially. Tannins prevent bloat of the rumen and possess anthelmintic properties. *Asparagus* root regulates cholesterol metabolism and improves antioxidant status in hypercholesteremic rats. *Asparagus racemosus* (Shatavari) is recommended in Ayurvedic texts for prevention and treatment of gastric ulcers, dyspepsia and as a galactagogue.

6. Rumen fermentation pattern

Ruminants have unique power to degrade and utilize lignocellulosic feeds by microbial fermentation in the rumen. The fermentation end products and their ratio in rumen remain in a balanced form for the further utilization by the animal. Any deviation from this leads to such consequences either beneficial or detrimental. Secondary metabolites, such as phenolic compounds, essential oils, and saponins, produced by certain plants affect the rumen microbial activity. Essential oils are able to manipulate rumen fermentation, due to selective pressures exerted on different microbial populations, resulting in different bacterial numbers and activities, in both the liquid and solid milieu of the rumen. Moreover, these effects will differ depending on the chemical composition of the essential oils used. Pure and naturally occurring mixtures of essential oils, blends of essential oils (BEO) are available as commercial rumen manipulators. Crina by CRINA SA (Akzo Nobel, Gland, Switzerland) is the best mixture. It is a mixture of natural and nature-identical essential oil compounds that includes thymol, eugenol, vanillin, and limonene as its main components on an organic carrier. BEO has been shown to affect both volatile fatty acids (VFA) production and nitrogen and starch degradation in the rumen. Essential oil supplementation might selectively stimulate acetate formation. Cinnamaldehyde and eugenol



mixture, anise oil and capsicum oil may be used as modifiers of rumen fermentation in beef production systems. Some reported that the effect of herbs and spices on ruminal fermentation in beef cattle may differ depending on ruminal PH. Some studies have attempted to exploit plant secondary metabolites as natural feed additives to improve the efficiency of rumen fermentation such as enhancing protein metabolism, decreasing methane production, reducing nutritional stress such as bloat, and improving animal health and productivity. Sarsaponins have been reported to decrease the ammonia nitrogen concentration and can alter the acetate and propionate proportions. A non-significantly lower ammonia nitrogen concentration was found in herbal preparation (Ruchmax and Payapro) supplemented groups as compared to controls, and rumen microbes using all the ammonia produced and giving more precipitable nitrogen in herbal supplemented groups. The ammonia produced, together with some small peptides and free amino acids, is utilized by rumen microbes to synthesize microbial protein. Rumen bacteria are considered good scavengers of ammonia and can grow on the relatively low concentration of ammonia in ruminal fluid. When the microbial masses are carried through to the abomasum and small intestine their cell proteins are digested, absorbed and utilized by the animal. The efficient synthesis of microbial protein at a high ammonia concentration requires readily fermentable and available source of energy and also readily degradable carbohydrates; which matches the synthetic ability of rumen microbes. The proportion of volatile fatty acids in the rumen is affected by the diet composition and pH of rumen fluid. It is generally known that fibrous feed causes a rise in acetate proportion, whereas the addition of concentrates to diet. Herb and Herbal Supplements in Animal Nutrition leads to an increase in propionate proportion at the cost of acetate. Higher concentration of TVFA has been regarded as an indicator of better energy supply for milk production. Significant difference observed in bacterial and protozoal counts in the herbal combination supplemented indicated that herbs and their combination provide a favorable environment for microbial growth. Optimization of diet formulation and the utilization of feed additives have been shown to modify the rumen environment and enhance or inhibit the specific microbial population. Feeding of stomachic and rumenototics led to increase the number, species, and size of rumen microorganisms.

7. Selecting Herbs for Livestock Animals

When selecting herbs to add to the feed, not only the properties of the plants, but also the preferences of the animals should be taken into account. It has been noticed that, pigs are more likely to eat the feed with an addition of rosemary or garlic rather than ginger or oregano. Cows, on the other hand, willingly take common yarrow, thyme, and willow bark, the rootstock of coach grass, chamomile, centaury, lemon balm, St. Benedict's thistle or plantain leaves. When it comes to birch leaves, rupture worts, linden leaves, lemon thyme, sweet flag rhizomes, dandelion root or coltsfoot leaves, cows are fussier. Herbal plants can be selected depending on the expected effects and requirements. It should be kept in mind that not all of them will be willingly eaten by the animals, and that not every plant should be offered. Some herbs are antagonistic against one another and they should never be offered together. The plants may be fed in various forms: dried, fresh, as a decoction, infusion, extract or essential oils. In order to create a good herbal preparation mixture, one should take into account the active substances of the plants, physiological requirements of the animals, and the expectations of the consumers towards the



quality of eggs, milk, or meat. When it comes to calves, best are dry extracts and oils. In sows the most efficient herb preparations are dry extracts and fresh plants; in piglets and porkers, however, fresh plants do not bring about the desired effect, neither do dry extracts and oils in laying hens and broiler chickens.

8. Herbs in Cattle Nutrition

Herbs visibly improve the quality of products: milk and meat, and have a positive effect on animal health. The desired effect appears after regular and long-terms use. Medicinal plants contain valuable ingredients: fats, protein, starch, vitamins, mineral salts, pectin, cellulose and biologically active substances. The evaluation of the nutritional value of feedstuffs most often focuses on the production performance indicators, such as body weight gains, feed intake and conversion, and milk or meat yields. In high-yielding cows there is often a reduced immunity and, as a consequence, an increased susceptibility to diseases. Some authors have demonstrated that the administration of 2% herbal mixture containing common yarrow, chamomile, Agrimonia, Alchemilla positively affects the quality of milk. It was shown that milk obtained from cows fed with the mixture was characterized by significantly lower counts of somatic cells, lower bacteria count, and reduced contamination with mold and yeast, as compared to milk from cows in traditional feeding. There was an increase in acidifying bacteria from 62% to 88% and significantly low frequency of pathogenic bacteria that contaminate milk. A reduction was noted in *Staphylococcus aureus*, from 57% to 3%, and *Streptococcus agalactiae*, from 14% to 2%. This means that the udder health improved and the nutritional value of the milk improved too. Herbs also increase the appetite, which means that the cattle take more feed, which in turn causes better conversion. With the addition of 2.0% and 1.0% herbs (fenugreek, pansy, fennel, sage, thyme, chamomile, nettle, mint) to the feed increased the intake of solid feed, resulted in higher body weight, higher daily gains and better conversion of feed. It was observed that the use of herbal extract in calves positively affects the concentration of iron, zinc and copper in the blood serum. In dairy cattle, feeding with herbal mixtures containing dandelion, caraway, agrimonia, chamomile, sage, yarrow, lemon balm, lilac improved chemical composition of milk and enhanced milk yields.

9. Herbs in Broiler Nutrition

The use of herbs in broiler feeding has a positive effect not only on rearing but also on the quality and color of the carcass. The practical application of such additives depends on bird's age, type of feed, production type and housing conditions. Studies on the influence of herbs on proteolytic enzymes (peptidases) revealed that herbs in feeds for broilers positively influenced the animal body weight. They can therefore be a good alternative to antibiotic growth promoters and synthetic drugs [Kapica et al. 2006].

10. Herbs in Swine Nutrition

The beneficial effect of herbs on the health of animals is also used in pork production. In this case, immunostimulating preparations play an important role in the neonatal and postnatal periods in piglets. During these periods, piglets are particularly exposed to numerous diseases and disorders caused by microorganisms. This is important from an economic point of view, since the prevention of diseases is expensive and at the same time limited. For these reasons, it is important to maintain the appropriate housing conditions of individual piggeries (hygiene, ventilation, temperature), nutrition (administration of



milk and colostrum), behavior of the staff, and health of the piglets. Lack of resistance and environmental factors is the cause of high mortality and morbidity of newborn piglets during the period from birth to weaning. For this reason, many studies are carried out on the immunity of juvenile livestock animals. Many medications based on medicinal herbs have been created that have immunomodelling, anti-stress or adaptogenic effects. A study aimed at determining the effect of a herbal preparation on piglet rearing results and their immunity showed its beneficial effect on body weight at birth, viability, growth rate during rearing and serum immunoglobulin concentration. There was an increase in serum IgG concentration in piglets at weaning on day 28. In all animals fed the herbal preparation, the concentration of immunoglobulin's IgA and IgG was higher by an average of 21% (fed without the addition of herbs). The mean body weight of piglets from the weaning experimental group was higher by 3.9% and 6.7% compared to the control group [Markowska-Daniel et al. 2010]. An addition of herbs has a positive effect on swine reproduction. Fennel, cumin, juniper or nettle improve milk yields of lactating sows and their reproduction parameters. There is better appetite and increased metabolism in sows during the periparturient period. Herbs reduce the duration of labor and ease the removal of the placenta, which greatly affects young piglets and increases their survival. Anti-inflammatory activity of chamomile improves the condition of the litter [Paschma 2007]. Administration of cumin to high-yielding sows effectively prevents agalactia, which often is the case following a difficult parturition. Coach Grass, nettle and garlic increase feed intake, which is especially important during the weaning of piglets. As a result, the digestibility of the feed and its components increased. An improvement of metabolic processes was also demonstrated, which resulted in the protein deposition in the carcass. Studies were carried out on birth-hypo trophic piglets. They were characterized by poor immunity as a result of lactation dysfunction in dam sows.

Conclusion

In the concept of the production of healthy birds without the use of antibiotics herbs can be relevant in many different ways. They can regulate feed intake and stimulate digestive secretions. An optimized digestion capacity and reduced risk of digestive disorders are the consequence. Several phytochemicals like essential oils or dietary fibre can contribute to a balanced micro flora (eubiosis), an optimal precondition for an effective protection against pathogenic micro-organisms and an intact immune system. Herbs and botanicals contain many different antioxidants with a high potential for the protection of nutrients against oxidation in the digestive tract, in metabolism as well as in the products.