

Utilization of Herbal Remedies to Improve Ruminant Performance: A Review**Kifah Jumaah Odhaib^{1*}, Measem Hassan Ali Alallawee¹ and Zainab A.H AL-Mousawi²**¹Department of Veterinary Public Health, College of Veterinary Medicine, University of Basrah, Iraq²Department of Physiology, Pharmacology and Biochemistry, College of Veterinary Medicine, Basrah University, Iraq.***Corresponding Author:** kifah.jumea@uobasrah.edu.iq**Doi:** <https://doi.org/10.37940/AJVS.2021.14.1.2>**Received: 12/1/2021 Revised: 8/5/2021 Accepted:17/5/2021**

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<http://creativecommons.org/licenses/by/4.0/>.**Abstract**

The purpose of this review is to summarize the effectiveness, modes of action and commercial application of herbal plants and their derivatives as growth promoters for animal. As described in literature, the increase in the growth of farming prices and feed costs for small ruminant in general, led to increases difficulties in production of livestock. To dissolve this issue, several studies concentrated on new alternative of feed resource, but others have tried to enrich milk products and meat by rising polyphenol compounds content to their by introductions of herbal plants in sheep and goat feed. Currently, consumers demand safety and the quality of feeding. Since antibiotics can be leave residues in ruminant tissues, that could induce subsequent emergence of resistant strains of microorganisms capable of endangering the health of livestock and human. This scenario has given the impetus to explore alternatives to antibiotics in animal nutrition. Consequently, as replacement for the synthetic growth promoter's antibiotics, natural products like herbs and spice as natural feed additives come to the attention to enhance physiological functions. So, the use of feeds containing bioactive compounds such as thymol, flavonoids, saponins, limonene, thymoquinone, essential oils and others which concentrated in different parts, such as leaves, roots and seeds that can be used for these purpose in animal feed and responsible for the healthy animal product. Furthermore, one of the hot points in the advanced research is the stability of animal product against the oxidative deterioration process that limits the shelf life.

Keywords: Ruminant, Spices and Herbs, Antioxidant Activity, Growth promoter

استخدام العلاجات العشبية لتحسين اداء المجترات: مقال

المستخلص

الهدف من هذا المقال هو تلخيص الفعالية والتطبيقات العملية والتجارية للنباتات العشبية ومستخلصاتها واستخدامها كمحفزات لنمو الحيوان. كما اوضحنا في هذا المقال، ادت الزيادة في نمو اسعار الزراعة وتكاليف العلف للحيوانات المجترية الصغيرة بشكل عام إلى زيادة الصعوبات في إنتاج الثروة الحيوانية. لحل هذه المشكلة، ركزت العديد من الدراسات على بديل جديد لموارد الأعلاف، بينما حاول البعض الآخر إثراء منتجات الألبان واللحوم عن طريق زيادة محتوى مركبات البوليفينول إلى هذه المنتجات عن طريق إدخال النباتات العشبية في علف الأغنام والماعز. في الوقت الحالي، يطالب المستهلكون بالسلامة وجودة التغذية. بما أن المضادات الحيوية يمكن أن تترك بقايا في أنسجة المجترات، فقد يؤدي ذلك إلى ظهور سلالات مقاومة من الكائنات الدقيقة القادرة على تعريض صحة الماشية والبشر للخطر. أعطى هذا السيناريو الزخم لاستكشاف بدائل للمضادات الحيوية في تغذية الحيوان. وبالتالي، كبديل لمحفزات النمو الاصطناعية (المضادات الحيوية)، يتم الاهتمام بالمنتجات الطبيعية (الأعشاب والتوابل) كمضافات علفية طبيعية لتعزيز الوظائف الفسيولوجية. لذلك فإن استخدام الأعلاف التي تحتوي على مركبات نشطة بيولوجيا مثل الثيمول والفلافونويد والسابونين والليمونين والثيموكينون والزيوت الأساسية وغيرها والتي تتركز في أجزاء مختلفة مثل الأوراق والجذور والبذور التي يمكن استخدامها في علف الحيوانات والمسؤولة لمنتج حيواني صحي. علاوة على ذلك، فإن إحدى النقاط الساخنة في البحث المتقدم هي ثبات المنتج الحيواني ضد عملية التدهور التأكسدي الذي يحد من العمر الافتراضي.

Introduction

The industry of small ruminants is ideally positioned for intensification and evolution. On the production side, a small ruminant like sheep and goats are well appropriate to the wide ranges of both socioeconomic and geophysical conditions most frequently encountered in the area. Nonetheless, sheep and goats are able to alter the forages that low quality into the produces that high quality; the size is small; use minimal land space and require low capital investment per head, making them ideal incomes to farmers that have limited income, general acceptability by most people (1). Through the previous two decades, especially in Latin America and Asia, actual per capita income has been rising, allowing enhanced access to markets as well as products of high value. Consequently, to meet the requirements for quality meat lambs in the markets, Agriculturalists need new applications to modern technology methods to produce more efficiently in animal's husbandry. In general, increase in the growth of farming prices and feed costs for small ruminant led to increases difficulty of animal production. To dissolve this issue, several studies concentrated on new alternative of feed resource (2), but others have tried to enrich milk products and meat by rising polyphenol compounds content to their by introductions of herbal plants in sheep and goat feed. Since synthetic antibiotics are deposited in the tissues of animals and transmitted to humans while consuming meat, a limited amount of antibiotics is mostly used for growth promotion in contrast opposed to remedy use. As a result, bacteria can become antibiotic-resistant (3). Antibiotic resistance's emergence and spread endangers productive animals' nutritional and economic potential. This is a worldwide problem that has impact ecosystems for either human or animals. By 2050, nearly 10 million people could die from bacteria resistant to antibiotics, according to a study commissioned by the United Kingdom (UK). For that reason, in 2006, the European

Union (EU) banned the use of antibiotics in animal production (4). Therefore, as replacement for the synthetic growth promoters (antibiotics), natural products (herbs and spice) as natural feed additives come to the attention to enhance physiological or pharmacological functions (5). Natural feed additives such as herbs and spice are non-woody, flowering plants. It has smell and taste with an intensive usually added to foods of human which possess antioxidative, antimicrobial, immuno-modulatory and anti-inflammatory properties (6). Herbal plants are part of the feed additive class presently known as Phyto-genics. It has been considered mightily to the set of non- antibiotic growth promoters, for instance probiotics and organic acids which are already well established in animal diet (7). Their utility lies in several chemical compounds that cause particular physiological behavior in the animal's body (8). The most significant bioactive compounds are tannins, alkaloids, saponins, phenolic compounds and flavonoids. Research has confirmed that these bioactive compounds have been transferred to sheep meat (9) and milk (10, 11, 12) and the general improvement in the quality of milk (13). Moreover, sensory and physicochemical properties of cheese and milk products are influenced by goats feeding on a diet enriched with phenolic compounds (14). In addition, the high content of phenolic compounds in milk is linked to an improvement in oxidative stability, which increases the efficiency of milk. Thus, the antioxidant properties of several herbs that are common in the Mediterranean region, like thyme, rosemary and sage have been studied (15). On the other hand, multiple of the beneficial spices and herbs are original for Africa such as garlic (*Allium sativum*), bitter leaf (*Vernomonia amygdalia*), ginger (*Zingiber officinale*) scent leaf (*Ocimum gratissimum*), and they have been reported to improve animal production of livestock (16). The aim of this review to discusses the roles of various herbal plants enhance the efficiency of ruminants performance through their antimicrobial action (I already explained it

in the part of antimicrobial), antioxidant action, growth promoter, immune response which influence on function of gut led to decrease emission of methane in animals (17).

Action mode and activity

Phytogenic feed additives usually known as botanicals or phytobiotics and also identified as plant derived component incorporated into feed to amelioration productivity livestock thru improvement diet properties(7), improving the feed quality, and improve the production and performance of individual animals. Essential oils (volatile lipophilic compounds derived by cold expression or by steam or alcohol distillation), and oleoresins (extracts derived by non-aqueous solvents). The active substances content in products can vary widely, in the case of added the herbal plants, depending on the part of the plant used (for instance leaf, seed, bark or root), geographical origin and harvest season (18). Most importantly, the Phytogenic feed additives have been used as alternative growth promoters to chemicals synthetic materials and their positive effects on metabolic requirements and digestive and meat (19) and milk production and quality such as fatty acid profile and lipid oxidation (20). As it's known most herbal plants have coccidiostatic, antibacterial, antihelmintic, antiinflammatory, antiviral or, especially, properties of antioxidant. Thus, by aging time, herbs and spices may protect the diets against damage of oxidative. That commonly applied procedure at food human industry and pet diets (21). Most widely used herb for food/feed keeping is *Rosmarinus officinalis* (rosemary) could utilized alone and/or in blend with synthetic antioxidants or tocopherols (22). These activities of the herbal plant are due to the secondary metabolites such as folyphenol, flavonoids, flavanol, tannins, saponin, tropane alkaloids, hyoscyamine, caffeic acid derivatives and others. Besides of that, herbs like lemongrass (*Cymbopogon citratus*), garlic (*Allium sativum*)

and peppermint (*Mentha piperita*) have been used extensively to maintain the microbial ecosystem of the gastrointestinal tract (23). In addition, sarsaponin, a naturally occurring steroid saponin found in *Yacca schidigera*, is also thought to be a useful natural feed supplement. (24). On the other hand, green tea by-products are usually used at ruminant's nutrition as feed additives also can be applied a source of protein with no adverse impact at lactating cows' efficiency (25). Furthermore, *Rosmarinus officinalis* has been examined in different forms either as dried leaves or aqueous or ethanol extracts (26,27,28) as it contains a high level of monoterpenoids α -pinene, β -pinene, camphene, 1-8 cineole, camphor, borneol, bornyl acetate, verbenone, carnosol, carnosic acid, rosmanol and epirsomanol (29,30, 31).

List (1) Herbs that commonly used in ruminant feeding and their effects (32, 33,34,35)

N.	Plant and scientific name	Use part	Active ingredients	Activity
1	Anise (<i>Pimpinella anisum</i>)	Fruit	Trans-anetole, estragole, γ -hymachalen, and methyl cavicol	Antioxidant, antimicrobial and antipyretic
2	Arnica (<i>Arnica Montana</i>)	Flower	Sesquiterpene lactones, such as helenalin and 11,13- dihydrohelenaline and chamissonolid	Antibacterial, Anti-inflammatory, Analgesic and Anti-aggregant
3	Buckwheat (<i>Fagopyrum esculentum</i>)(Seeds, leaves	flavonols and flavones such as rutin, hyperin, quercitrin, orientin, and isoorientin	Antioxidant, inflammatory and antimicrobial activity
4	Black pepper (<i>Piper nigrum</i>)	Fruit	Alkaloids flavonoids, cardiac, piperine (1-peperoyl piperidine), chavicine, piperidine, and piperetine	Antioxidant, antitumor, antipyretic, analgesic, anti-inflammatory, anti-diarrheal, antibacterial
5	Black cumin seed (<i>Nigella Sativa L</i>)	Seeds	Alkaloids which include nigellidine and nigellicine, thymoquinone, carvacrol	Antihypertensive, antidiabetic, anticancer, antimicrobial, and anti-inflammatory
6	Clove (<i>Syzygium aromaticum</i>)	Buds	Eugenol Oil contains carvone, geraniol	Digestion stimulant, Appetite, antimicrobial, choloretic and insecticidal
7	Cinnamon (<i>Cinnamomum zeylanicum</i>)	Bark, flowers and	Eugenol, phenolic and polyphenolic substances	Antioxidant, antiviral, Anti-lymphomic, antifungal and purifying
8	Coriander (<i>Coriandrum sativum</i>)	Seeds and leaves	Limonene, camphor, linalool, flavonoids, quercitin, rhamnetin, and epigenin.	Appetizer, carminative and stomachic
9	Cumin (<i>Cuminum cyminum</i>)	Seeds	Substituted pyrazines, 2-ethoxy-3-isopropylpyrazine, and 2-methoxy-3-sec-butylpyrazine	Digestive, carminative, galactagogue

10	Daffodil (<i>Narcissus tazetta L.</i>)	Flowers	Flavonoids, alkaloids, saponins, tannins, cardiac glycosides, steroids, terpenoids	Anticancer, Anti-HIV Anti-inflammatory and Neurotonic
11	Fenugreek (<i>Trigonella foenumgraecum</i>)	Leaves and seeds	Protodioscin, trigoneoside, diosgenin and vamogenin	Antimicrobial, Anti-inflammatory and antioxidant
12	Fennel (<i>Foeniculum vulgare</i>)	Seeds and leaves	Fenchone, anethole, limonene and estragole	Stomachic, Carminative, purgative and diuretic
13	Galla Rhois (<i>Rhus chinensis</i>)	Leaves	Methyl gallate and gallic acid	Antifungal and antiviral propertie
14	Garlic (<i>Allium sativum</i>)	Bud	Antioxidants, flavonoids, S-allyl-cysteine sulfoxides, alliin and allicin	Stomachic, appetizers, immunity enhancer and methane inhibitor
15	Green tea (<i>Camellia sinensis</i>)	Leaves	Catechins ((-)-epigallocatechin-3-gallate) caffeine, theanine gallic acid and chlorogenic acid	Anti-inflammatory, anti-oxidative, anti-mutagenic, and anti-carcinogenic
16	Guava (<i>Psidium guajava</i>)	Leaves, seed and Fruit	Ascorbic acid, polyphenols, flavonoids and carotenoids	Antioxidants, anti-diarrhoeal, antimicrobial, antiviral, hypoglycaemic, hepatoprotective
17	Harad (<i>Terminalia chebula</i>)	Fruits	Cinnamic acids, phloretic acids, p-coumaric acids, and ferulic acids	Reduction in methane emission
18	Lemon balm (<i>Melissa officinalis</i>)	Leaves	Rosmarinic acid, caffeic acids, and metrilic acid	Mild sedative, spasmolytic and antibacterial.
19	Lemongrass (<i>Cymbopogon citratus</i>) (32)	Shootes and leaves	Citronella, myrcene, citral, citronellol and geraniol	Antibacterial, bactericidal, and fungicidal properties
20	Marsh mellow (<i>Althea officinalis</i>)	Leaves and roots	Pectin, mucilage, starch and cane sugar	Reduce irritations caused by acute inflammation and in cough
21	Neem (<i>Azadirachta indica</i>)	Leaves	nimbinine, nimbidin and nimbin	Antifungal, antiviral, stimulate fibre degrading enzymes and antibacterial

22	Oregano (<i>Origanum vulgare</i>)	Flowers and leaves	Ursolic acids, Leanolic acids and phenolic glycosides	Meat preservative and antibacterial
23	Peppermint (<i>Mentha piperita</i>)	Stems and leaves	Tannins, bitters and Volatile oil	Antibacterial and spasmolytic
24	Parsley (<i>Petroselinm crispum</i>) (32)	Leaves	Apiol, flavonoids, coumarins and vitamin C	Appetite and digestion stimulant, antiseptic
25	Rosemary (<i>Rosmarinus officinalis</i>)	Leaves	Tannin, resins, bitter substances and volatile oil	Anti-inflammatory and antioxidant
26	Savory (<i>Satureja hortensis</i>)	Flowers and leaves	Thymol phenolic compounds, flavonoids, steroids, acids, and pyrocatechols	Antioxidant, antimicrobial and anti-inflammatory, cancer, Alzheimer's
27	Sage (<i>Salvia officinalis</i>)	Leaves	Caryophyllene, Linalol	Digestion stimulant, antiseptic, throat and lung issues
28	Spearmint (<i>Mentha spicata</i>)	Leaves, flowers	Carvon, dihydrocarvone, and 1, 8-cineole	Antioxidants, cholinesterase inhibitors, pancreatic lipase
29	Thyme (<i>Thymus ulgaris</i>)	Whole plant	P-Cymene, myrcene, borneol, and linalool	Digestion stimulant, appetite, antiviral activity and antibacterial
30	Ginger (<i>zingiber officinale</i>)	Rhizomes	Camphene, β -bisabolene and arcurcumene	Gastric stimulant and Methane reducing capacity

Use of herbal plants as digestion enhancer and growth promoter in ruminants

In the recent years, the use of herbal products has gained increased attention in ruminant production, because used of antibiotic growth promoters by animal nutrition could leave residues in animal tissues, which could induce garnered more attention in recent years.

Previous studies revealed that the herbs like turmeric, cinnamon, coriander, clove and cumin act as natural antibiotics, killing bacteria that

subsequent emergence of resistant strains of microorganisms (36, 37) capable of endangering the health of livestock and human. This scenario has given the impetus to explore alternatives to antibiotics in animal nutrition (38, 39, 37). Therefore, alternative traditional herbs have been

producing methane, while allowing bacteria that are less harmful to function in their place. In an experience at Newcastle University involving the five curry spices, it was found that ground up

coriander applied to an in vitro solution mirroring that found in the rumen of cows and sheep caused (40%) decrease in methane gas production (40). Feed intake, live weight and average gain are important parameters in livestock production. Studies in the past had shown that fed dairy cows with garlic essential oils 5 g/d and juniper berry essential oils 2 g/d Enhanced feed digestibility in the rumen, but possibly at the expense of a reduction in the flow of bypass protein to the small intestine. Feeding monensin may be beneficial in terms of rising bypass protein from the rumen but did not enhance milk production or feed digestion (41). Moreover, Multiple of the beneficial spices and herbs are indigenous for Africa and include garlic (*Allium sativum*), ginger (*Zingiber officinale*), bitter leaf (*Vernonia amygdalifolia*), scent leaf (*Ocimum gratissimum*), and they have been reported to improve animal production of livestock (16). Furthermore, *Allium sativum* contains large amounts of polyphenolic components and flavonoid, and these bioactive components scavenge free radicals within the animal. In addition, supplementation with (7%) coconut oil plus (100 g/day) of *Allium sativum* powder could be used effectively in the rumen and so, could provide good fermentation end products and improve the ecology of rumen for the host swamp buffaloes, especially in reducing the production of (9%) methane gas without altering the digestibility of nutrients (42). Recently, several studies reported that dietary supplementation with (10 g DM) plantain herb and/or 10 g DM of *Allium sativum* (garlic leaf) enhanced crude protein intake, dry matter intake, feed conversion ratio and body weight gain were recorded in the herbal supplemented diet compared with the control diet (43). Another study also reported that *Rosmarinus officinalis* leaves and essential oil reduced crude protein and dry matter digestibility and tended to decrease rumen ammonia concentration in sheep (27). In contrast, dietary turmeric and *Andrographis paniculata* leaves did not affect feed intake and growth performance in

goats. Contrarily, dietary *Andrographis paniculata* leaves and stem increased feed intake and growth performance in goats (44). Also, dietary supplement with (*Nigella sativa*) seeds or (*Rosmarinus officinalis*) leaves at concentration 1% enhanced nutrient digestibility in lambs (19). Thus, it contains many compounds of sulphur that adjust microbial of the rumen fermentation and enhance sheep performance (45). Several research shown that supplementation of (1.0) to (1.3) g DM of *Plantago lanceolata* L. (plantain) and *Allium sativum* (garlic leaf) per kg of live body weight of lambs fed with pellets (total mixed ration TMR) or (mixed hay) led to improve lambs production (43,46). Moreover, addition of *N. sativa* meal until rate 66.7% as alternative source for cotton seed meal in diets of sheep may recommend improving feed utilization and growth performance of growing Farafra sheep (47).

Use herbal plants as antioxidant in ruminants

There can be mutable activity of the various antioxidants. This relies on the solubility and polarity, and also the activity place. Several antioxidants are used to keep the nutrients in the feed through storage. As well as have their prevalent activity in the digestive tract where they could also help that the substances sensible for oxidation may absorb (48). Uses of herbs as antioxidant in animal nutrition and products have been established. Cells need adequate levels of antioxidant protection in all living systems in order to avoid the deleterious influence of an excessive production of reactive oxygen species (ROS) and to avert any deterioration in cells of immune (49). Therefore, herbs contain phytochemicals, which exhibit antioxidant properties. It contains a broad range of organic substances, represented primarily via alkaloids, tannins, flavonoids, saponins 1,8-cineole, carnolic acid, carnolic acid, camphor, alpha-pinene, beta-pinene, and phenolic compounds in herbs (50).

The impact of diet on lamb meat oxidation have

been studied, while announce that the stability of oxidation in lamb meat is dependent clearly on herbal plant (51). All antioxidants in spices and herbs are very effective because they possess excellent antioxidant activity (21). Another study found that adding 4g Roselle /kg DM and/or 4g Lemongrass/ kg DM were significantly increased total antioxidant capacity in treated ewes compared to untreated ewes (47). Adding supplement of turmeric, vitamin and *Andrographis paniculata* to the diets, it was discovered that meat from supplemented goats had greater antioxidant activities and sensory quality has been improved when they compare antioxidant contents in meat (52). Nonetheless, in one study sheep fed with (*Rosmarinus officinalis*) and/or (*Nigella sativa*) decreased oxidation of lipid in three muscles for sheep (19). Besides, Chinese herbs mixtures for goats increased plasma activities of nitric oxide synthase, glutathione peroxidase and total superoxide dismutase and plasma total anti-oxidative capacity (54). The sole or combined supplementation of (garlic leaf) *Allium sativum* or/and (plantain) *Plantago lanceolata* had a significant effect on the levels of serum antioxidants compared with the control group, greatest rates were observed in plantain group and then in plantain herb+ garlic leaf and garlic leaf group for TAC, GPx, SOD and catalase (43). In fact, in steers, supplement of herbal plant rich in antioxidant could be useful for tissue renovation liver (55).

Use herbal plants as antimicrobial gas production in ruminants

In order to enhance production performance in ruminants, herbal plants characterized by activity of antimicrobial and capable of manipulating rumen microbial fermentation (56, 50). Plant secondary metabolite in herbs can modify rumen fermentation and can reduce rumen methanogens and protozoa, thereby enhancing feed efficiency in ruminants (57). In addition, dietary saponin supplementation in feed in lambs reduced numbers of protozoa in the rumen liquor and the

daily release of methane (58). Moreover, protozoal populations in rumen fluid decreased from steers that fed concentrate supplemented with plant phenolic compound such as saponin plus hay, methane emission reduced nearly 12.7% *in vivo* and 15%–44% at 24 h fermentation *in vitro* (59). Herbs exhibit selective antibacterial activity, and may inhibit the degradation of protein in the rumen, thereby increasing the intestinal supply of amino acids to the animal host (60). Besides, many of herbal plants contain essential oils and / or active compounds such as lemongrass, turmeric, galangal, rosemary, clove and cinnamomum, etc. on modifying rumen fermentation and positively affect methane emission, volatile fatty acids (VFA's), protein, carbohydrates degradation and reduce ruminal bio-hydrogenation (61,62). While these positive effect in the ruminal fermentation accompanied with negative effect on fiber degradation (63). Supplementing diets with celery or thyme showed no significant pH, microbial protein, ammonia-N concentrations and improved short chain fatty acids concentrations and significantly lowered total gas production (64). Another study informed that the protozoa population size decreased with adding of (*N. sativa* meal) to the lambs diets (65). Besides of that the herbal plant extracts (Wormwood, *Allium sativum* for. *Pekinense*; *Artemisia princeps* var. *Orientalis*; Garlic, *Allium cepa*; Ginger, *Citrus unshiu*; Onion, *Zingiber officinale*; Honeysuckle; Mandarin orange, *Lonicera japonica*) were shown to have properties to reduce acetate to propionate ratio and methane production, increase fibrolytic bacteria species and decrease methanogen population. It well-known that the cell wall contents (NDF and ADF) have negatively affected on gas production which tends to reduce the microbial activity (66). Furthermore, carnosic acid especially carnosol which is the main active diterpenes in *Rosmarinus officinalis*, might be fixed in muscle of lamb at adequate amount to have antimicrobial influence on lamb meat (67). It has been evidenced that oil-free extracts from

rosemary derivatives has yielded a positive and stabilize outcome in animal feeding perhaps due to the homogeneity and alignment of the required quantity of the active compound. For instance, raw lamb's shelf life was increased by (4 days) when the diets of lambs were supplemented with (200-600 mg/kg) diterpenes (68, 69, 70, 71). Moreover, the antimicrobial effects of dietary oil-free rosemary leaf have been established in lamb packed under modified atmosphere, which recommends the possibility of exploiting this rosemary byproduct in lamb nutrition. Dietary supplementation with different herbal plant enhanced utilization via stimulating cellulolytic bacterial activity in the rumen fluid and inhibiting protozoa numbers and methanogenic bacterial populations, thus, perform in decreased loss energy by methane (72). Similarly, addition essential oil to the diets has no negative effect on fiber degradation (73). Using medical plants in animal diets had no negative effect on activity and growth of the major cellulolytic bacterial population (74). Mixture of thyme plus celery could be alternate for ionophoresin the ruminant diets to enhance ruminal fermentation, reducing gas production without any negative effect on nutrients degradability (75).

Use herbal plant as improved immune response in ruminants

Immune response is a natural process that takes place in the body, so one of the best ways to boost immunity is to supplement diet with natural herbs. Unlike medications that may contain chemicals, natural herbs are safe and lack toxins that weaken the immune system. Nevertheless, the scientific literature is replete with herbs that are known to have antioxidant properties have been used to replace tocopherol in animal diets (76).

Past studies, observed that eugenol in essential oils enhance immune power by raising synthesis of IgG and IgA in body and saliva respectively (77). Moreover, the IgG serum concentration of group content 0.75% ultra-fine (Chinese herbal) piglets was higher than other supplemented

groups and the control on (7 day), while IgM serum in group content 1.5% ultra-fine (Chinese herbal) piglets significantly improved on day (7) and day (14) in addition, serum IgA concentrations were not changed among all groups on all days of determination (78). The first rate limiting issue for immunity causes peroxidation of lipid in the cell membrane led to excessive free radical generation due to oxidative stress in animals. Supplementing diets with (*P. lanceolata* PL) herbs has increased concentrations IgA in rising lambs (79). Furthermore, some components of *Nigella sativa* exert stimulatory roles toward T cell-mediated immune responses, whereas other components inhibit B cell-mediated immune responses (80, 81). Other findings discovered that improvement of total proteins, albumin and Immunoglobulin (IgG) in blood serum of ewes by garlic additives (82). Also, feeding ewes on ration contents 2% of garlic powder or 2 ml of garlic oil were insignificantly increased (IgG) and protein of colostrum and the content of milk from C18:1 ω 9, C18:2 ω 6 and C18:2 ω 3 and C20:0 fatty acids compared with control group. Supplemental fermented wheat bran polysaccharides (FWBPs) increased (IgG), (IgM) and IL-10 concentrations and CAT activity in plasma (83).

Besides of that, increased serum globulin and albumin concentration were absorbed in both plantain and (plantain herb+ garlic leaf) diet groups, and the highest concentrations of serum IgA, IgG₁, IgG₂ and IgM were recorded in the plantain diet group (43). Similarly, Supplemented diets with (*Nigella sativa* seeds, *Rosmarinus officinalis* leaves) had lower ($P < 0.05$) neutrophils, basophils and serum urea and greater serum (IgA) and (IgG) compared to the control group in lambs (19).

Conclusions

Beneficial effects of herbal plants on animals of livestock are observed by improving of feed intake, digestibility of nutrient, regulation of the immune system, stimulation of the endocrine

system, and intermediate metabolism of nutrients due to the greatest significant constituents of bioactive like saponins, alkaloids, phenolic compounds, tannins and flavonoids. Consequently, as an alternative to synthetic growth stimulants (antibiotics), natural products (herbs and spices) are being taken into consideration as natural feed additives to enhance physiological or pharmacological functions.

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