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GREATER CELANDINE *(CHELIDONIUM MAJUS)* IN LIVESTOCK NUTRITION

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Abstract

The greater celandine (Chelidonium majus) is a plant of the poppy family, commonly found in Europe and Asia. It is rich in isoquinoline alkaloids such as chelidonine and sanguinarine. The greater celandine is used in the treatment of various diseases, both in humans and animals. This paper presents an overview of research concerning the use of the plant in livestock nutrition. Research has been scarce to-date regarding the greater celandine as a feed additive. However, all clinical trials on domestic hens, guinea fowls, quails, pigeons, horses and cows clearly indicate its positive effect on animals. It improves their immunity, reduces oxidative stress and has diastolic and antiparasitic properties. The plant has the potential to be a valuable additive in livestock nutrition.

Keywords: Chelidonium majus, nutrition, phytotherapy, livestock

Introduction

The greater celandine (*Chelidonium majus*) is a plant of the poppy family (*Papaveraceae*), common in Europe and Asia. It is usually found on the edge of forests, shrubberies and ruderal sites, and thrives as a garden weed. The greater celandine is rich in isoquinoline alkaloids, such as chelidonin, sanguinarine, cheleritrin, coptisine and berberine. These substances give the plant its medicinal potential (Colombo and Bosisio, 1996). The herb has been known and widely utilised for millennia, especially in Chinese folk medicine, with reports of the plant being used to treat skin lesions, digestive tract ulcers, and liver diseases (Maji and Banerji, 2015). The scientific community is keen to examine the plant and test its properties under laboratory conditions. Of particular interest to scientists is the ability of the alkaloids contained in the celandine to treat various types of cancer (Lohninger and Hamler, 1992; El-Readi et al, 2013; Capistrano et al, 2015).

For obvious reasons, the celandine is not only used in human medicine, its properties being also effective in animal treatment (Idolo et al., 2010; Belda et al., 2013). It has been known to improve the colour of egg yolks when given to hens (Blattna et al., 1960). Nowadays,

the herb is celebrated mostly for its antispasmodic, antiparasitic, antibacterial and cholagogue effects (Grela et al., 2013). However, it causes harm in large amounts (Benninger et al., 1999). Relatively few scientific papers have been written on the use of the celandine in veterinary medicine. Most of the available literature treats animals merely as experimental models rather than proper treatment subjects. The hepatoxicity of the plant has been tested mostly on rats (Mazzanti et al., 2009; Gao et al., 2019).

The aim of this study is to use the search feature on Google Scholar to review publications on the use of the celandine as a feed additive for livestock. The search terms included keywords such as: 'chelidonium', 'chelidonium majus', 'celandine', 'greater celandine', 'poultry', 'chicken', 'chicken broiler', 'quail', 'pigeon', 'guinea fowl', 'horse', 'cattle'. No specific timeline was set to narrow down the search criteria.

The celandine in poultry nutrition

The largest number of experiments using the celandine have been carried out on various poultry species, including broiler chicken, guinea fowls, quails and pigeons.

The celandine in the feeding of hens

The use of the celandine in hen feeding was first documented in the early 1960s. Blattna et al. (1960) described how this plant was used to improve the colour of egg yolks. Park et al. (2014) tested the growth rate, meat quality, and blood cell levels in broilers given feed supplemented with extracts of the celandine, *Saposhnikovia divaricata*, and Japanese honeysuckle (*Lonicera japonica*). Four groups of one-day-old broilers were formed. The first, serving as the control group, was given standard fodder, while the other three were offered diets containing 0.2% extracts of *Saposhnikovia divaricata*, Japanese honeysuckle, and celandine, respectively. The study lasted five weeks. The birds in the experimental groups gained more weight than the control group. Daily increases were greatest in the celandine group. However, elevated levels of neutrophils, lymphocytes, monocytes, and eosinophilia were seen in the animals fed with *Saposhnikovia divaricate* and celandine-supplemented diets compared to the control group. The cooking process revealed no changes in the meat from the supplemented groups regarding parameters such as pH, colour, fatty acid content, or weight loss. TBARs (*thiobarbituric acid reactive compounds*) were reduced in the group given the diet with celandine extract. The inclusion of plant extracts was thought to improve weight growth, blood cell parameters, and meat quality in broiler chickens.

Pop et al. (2019) tested the efficacy of commercial herbal preparations in the treatment of coccidiosis in broiler chickens. Two experiments were conducted using three preparations: the first contained a mixture of extracts of common garlic (*Allium sativum*) and wild thyme *(Thymus serpyllum*), the second was composed of simple oregano (*Origanum vulgare*), summer savory (*Satureja hortensis*) and celandine, and the third was made of common garlic, nettle (*Urtica dioica*), elecampane (*Inula helenium*), liquorice (*Glycyrrhiza glabra),* rosemary (*Rosmarinus officinalis),* celandine*,* breckland thyme, tansy (*Tanacetum vulgare*) and coriander (*Coriandrum sativum)*. In the first experiment, the following groups were formed: chickens not infected with coccidia, chickens infected with coccidia, infected chickens given the coccidiostatic preparation amprolium at 2.5 g/l of water, infected chickens watered with the first preparation at 10 ml/l and infected chickens watered with the second preparation at 10 ml/l. In the second experiment, the following groups were created: chickens not infected with coccidia, chickens infected with coccidia, infected chickens given the coccidiostatic preparation amprolium at 5 g/l of water, infected chickens watered with the third preparation at 5 ml/l and infected chickens watered with the third preparation at 10 ml/l. The birds were infected by injecting a solution with coccidia of the genus *Eimeria* into the crop. It was shown that in the

groups where the first and second preparations were administered, the number of oocysts in the birds' faeces was lower compared to the infected groups that received no preparations and to the group where the amprolium preparation was administered at 2.5 g/l of water on day 7 post-infection. During post-mortem examinations, it was noted that necrotic intestinal lesions in the chickens from the groups watered with the first and second formulas were less severe compared to the other infected groups, but more so compared to the group that received water with amprolium. All infected birds had lower weight gains compared to the control group. The groups that received the first and second formulas showed better feed conversion rates than the infected groups that received no additives. The groups that received the third formulation with their water had a lower number of oocysts per gram of faeces than the infected and untreated group, but higher than the group that received amprolium at 5 g/l water. Birds in the group in which the third preparation was administered at 10 ml/l water had significantly fewer necrotic lesions in the cecum, better weight gains compared to the infected groups that received no preparation and high feed conversion, similar to the control group. It was found that the positive effect of the first and second preparations was not statistically significant, but the third preparation showed some efficacy against coccidia infections.

Arain et al. (2021) investigated the effect of the addition of different amounts of celandine extract on growth rates and nutrient digestibility in broiler chickens. The birds were divided into four groups. The control group did not receive any water additive, the experimental groups received the celandine extract at 0.5 ml/l water, 1.0 ml/l water, 1.5 ml/l water, respectively. It was found that the experimental groups had higher body weight gain, final weight and feed conversion compared to the control group. The birds in these groups were higher in crude protein and dry matter digestibility. The experimental groups also achieved lower mortality rates compared to the control group, but these differences were not statistically significant. The control group had a significantly higher susceptibility to disease compared to the experimental groups. The best results for most parameters were achieved by the group that received celandine extract at 1.0 ml/l of water together with their water. The addition of celandine extract in that amount was believed to be the most beneficial for the broilers, producing the most positive outcomes such as higher growth rates and better feed conversion.

The great celandine in the feeding of guinea fowls

The experiment by Gupta et al. (2014) aimed to demonstrate the effect of homeopathic mother tinctures of Indian bael (*Aegle marmelos*), celandine and punarnava (*Boerhavia diffusa*) on the characteristics of guinea fowl carcasses. 180 day-old birds were divided into four groups. The first (control) group received no water additive. The other three were given a supplement of Indian bael, celandine and punarnava with their water. At 1-4 weeks of age, the guinea fowls received the tincture at 0.05 ml per animal, at 5-8 weeks of age at 0.08 ml per animal and at 9-12 weeks of age at 0.1 ml per animal. The groups watered with tinctures showed better slaughter performance compared to the control group. Particularly satisfactory results were reported for the group given water supplemented with celandine. Also, it was noted that the weight of pectoral and thigh muscles increased to some extent in the tincture-treated groups. The weight of the internal organs also rose in the supplemented groups, although only in the case of the spleen were the values statistically greater. An increase in the weight of this organ was particularly notable in the group supplemented with the celandine tincture as a result of the plant's immunomodulatory properties**.**

Gupta and Palod (2014) conducted an experiment to test the effect of tinctures of Indian bael, celandine and punarnava on lean meat yield from guinea fowls. One-day-old guinea fowls were divided into one control and three experimental groups and given the said plant tinctures with their water. The experimental groups were found to have elevated crude protein in the breast and leg muscles, while also having low fat content. It was concluded that the addition of

plant tinctures used in the experiment could be helpful in raising animals for lean meat production.

Gupta et al. (2016) also discussed how the Indian bael, celandine and punarnava tinctures impacted the blood biochemical profile and immunomodulatory properties in guinea fowls. This experiment was conducted along the same lines as the two earlier trials (Gupta et al., 2014; Gupta and Palod, 2014). Cholesterol and blood glucose levels were found to be lower in the tincture-supplemented groups. It was also observed that immune systems performed better in the birds given plant tinctures with their water, especially in the group that received the celandine tincture. In conclusion, it was found that the addition of Indian bael, celandine and punarnava had a positive effect on the blood biochemical parameters in guinea fowls and boosted their immune system.

Celandine in the feeding of quails

Senyk and Kononskiy (2010) performed an experiment to evaluate the effect of the addition of celandine on body weight gain in quails. One-day-old quails were divided into three groups. The first (control) group received just water. The second group received with their water a 10% water infusion of celandine at 0.07 ml/kg body weight, while the third group received a 10% ethanol-based tincture of celandine, also at 0.07 ml/kg body weight. The experiment lasted 10 weeks and the birds were weighed every 10 days. Higher body weights were recorded for the experimental group compared to the control group. In particular, the birds given the added ethanol-based tincture achieved better growth rates. There was also a lower mortality rate in the experimental groups. No diseases were noted that could be possibly attributed to the added celandine. It was concluded that celandine as a water-soluble supplement had a positive effect on quail body weight gain, which is probably a consequence of better digestion and nutrient absorption.

Celandine in the feeding of pigeons

Belda et al. (2013) decided to find out which plants are used as a dietary supplement for pigeons by farmers in eastern Spain, where these birds are very popular. The authors researched different plant species through interviews with breeders as well as books and magazines published locally. Local farmers fed their pigeons with 56 plant additives to improve the birds' immunity, health and plumage, and increase their reproductivity. One of these plants was celandine. Harvested as a wild crop, it is mostly used as a remedy when a bird is ill. The stems or leaves of this plant serve as a dietary supplement. The study clearly demonstrates the extensive expertise of eastern Spanish farmers regarding the local flora and its practical application in pigeon breeding.

Celandine in the feeding of cattle

Celandine is no longer commonly found in cow feed. To achieve maximum productivity, cows – particularly dairy cows – are often given full-ration diets. The animals are most likely to encounter the celandine on pastures. However, it has long been recognised that the celandine may be poisonous to cattle in high amounts, and its presence should be avoided in places where cows graze (Reeks, 1903). Nonetheless, there is evidence that farmers have utilised the herb to cure ailments in these animals. Idolo et al. (2010) carried out a survey to find out how much people from the regions of Italy's oldest national parks know about the practical application of various plant types. The subjects mentioned a medicinal celandine infusion used to help cows to evacuate their placentas. Vlková et al. (2015) studied the use of several plants by the Czech diaspora in the Banat region of Romania. Information was gained concerning the use of the celandine as a cow feed additive for treating gastrointestinal illnesses. The authors of both

studies discovered that the use of plants to heal animals is mostly practiced by the elderly, and it is possible that this knowledge will soon disappear.

Kroupová et al. (2006) investigated the effect of homoeopathic medicines on diarrhoea prevention in newborn calves. A total of 343 calves were used in two studies. The newborn animals in each study were divided into two groups: control and experimental. When the calves in the control groups were unwell, they were given the medication that was typically administered in that herd. In the experimental groups, the animals received a preventive oral preparation containing substances such as *Arsenicum album*, *Calcarea carbonica*, *Ipeca*, sodium sulphate, and plants such as autumn crocus (*Colchicum autumnale*) and celandine, in addition to medication at the time of illness. In experiment 1, the experimental group received this preparation on days one, two, and three after birth, and in experiment 2 on days one, three, and five. The experimental groups had lower mortality rates than the control groups. A decreased death rate was also observed in the group that received the homoeopathic medicine during the first three days after the calves' birth. Furthermore, the experimental groups had a decreased frequency of diarrhoea. The researchers demonstrated that using this treatment as a prophylactic measure improved the calves' immunity and decreased their mortality.

Celandine in the feeding of horses

Spinu et al. (2018) conducted a study on the effects of different plant extracts on the *in vitro* cellular immunity of horses. Three groups of horses took part in the study – those used in agricultural work, those trained regularly and those used occasionally. Blood samples were taken from these animals before and after exercise, diluted with RPMI 1640 medium and divided into twelve groups: a control without any additives, a sample with phytohaemagglutinin, a sample with lipopolysaccharides, a sample with 70% alcohol and a range of plant extracts derived from dandelion (*Taraxacum officinale*), common comfrey (*Symphytum officinale*), marsh horsetail (*Equisetum palustre*), violet (*Viola tricolor*), oats (*Avena sativa),* shepherd's purse (*Capsella bursa pastoris*), St. John's wort (*Hypericum perforatum*) and celandine. Higher levels of immune system stimulation were observed in animals working regularly, both after and before exercise. The stimulation indices were higher in the samples where plant extracts had been added, except in the groups with violet and oat extracts (these plants had the effect of reducing the tested indexes). The highest pre-exercise and post-exercise levels were recorded for the samples with the addition of shepherd's purse and celandine, respectively. However, these values were not statistically significant. Spinu et al. (2018) found that regular exercise, and therefore adaptation to a certain level of stress, increases the immune system response. It was concluded that the addition of plant extracts could modestly increase equine immunity and alleviate the consequences of exercise-induced stress.

The study by Stefanowski et al. (2021) aimed to investigate the effects of different celandine extracts on markers of oxidative stress in equine blood plasma. Significant amounts of celandine were collected from urban and rural areas to prepare extracts from its roots and stems. Blood was collected from 18 horses of different breeds used for recreational riding. The blood was coagulated with sodium citrate to obtain plasma. Five samples of 1.9 ml were then prepared from the plasma. Phosphate buffer, pH 7.4, was added to the first, which was the control group, at 0.1 ml. To the experimental samples, 0.1 ml each of celandine extracts was added, derived successively from roots collected in urban areas, stems collected in urban areas, roots collected in rural areas and stems collected in rural areas. It was observed that the total antioxidant capacity increased significantly in the samples with the addition of the celandine extract, especially in the samples with root extract from rural areas. TBARs levels also decreased in these samples. It was concluded that the dietary addition of celandine extract, especially root extract from unpolluted areas, can considerably reduce oxidative stress in horses

and help in the treatment of various diseases, especially metabolic diseases. Both of these studies (Spinu et al., 2018; Stefanowski et al., 2021), though performed *in vitro*, demonstrate that celandine added in small amounts to horse feed can show beneficial effects.

Summary

The celandine has a diverse range of alkaloids, which provide it with promising prospects for treating several animal ailments. As a feed supplement, it boosts the immune system, mitigates oxidative stress, and aids in combating parasite infections in the digestive system. As a consequence, animals enjoy improved overall health and greater weight growth. Although celandine has favourable characteristics, it has not undergone much research. The medicinal potential of this plant has been shown via experiments carried out on domestic chickens, guinea fowls, quails, pigeons, cattle, and horses. The dearth of research on other species is likely attributable to concerns over the possible toxicity of celandine. Nevertheless, as shown by the aforementioned research, administering celandine in the correct dosage might be a beneficial addition to animal nutrition.

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