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### Traditional ethnoveterinary knowledge of indigestion or diarrhoea treatments in cattle on the Bilogora hills in Croatia

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#### Abstract

Traditional knowledge of plants and their preparations used for the treatment of animal diseases was passed down orally from generation to generation, so there are no written records or they are very rare. This study is based on the first documentation of ethnoveterinary knowledge for indigestion or diarrhoea treatment in cattle on the Bilogora hills in northwestern Croatia. Data collection was conducted from 2008 until 2018, in eighteen villages of four municipalities in the Koprivničko-križevačka county, Croatia. Plant specimens were well known, in addition they were confirmed and identified by the skilled botanist. Nine plant species: flax (*Linum usitatissimum* L.), chamomile (*Matricaria recutita* L.), hazelwort (*Asarum europaeum* L.), broad-leaved dock (*Rumex obtusifolius* L.), sweet chestnut (*Castanea sativa* Mill.), common oak (*Quercus robur* L.), white willow (*Salix alba* L.), common mallow (*Malva sylvestris* L.), yarrow (*Achillea millefolium* L.) from 7 botanical families were documented. Decoction and herbal tea were the most common preparation methods. The most often used plants to treat mild diarrhea in cattle were chamomile and broad-leaved dock, and for hard, watery diarrhoea bark of sweet chestnut and sessile oak. The most often used plants to treat indigestion in cattle were hazelwort, chamomille, and flaxseed. Farmers used mostly leaves (about 57%), flowers and stems (more than 25%), bark (about 13%), branches, and seeds (5%) for herbal preparations. Thus the aim of the present study is to document that ethnoveterinary tradition for the next generations.

**Keywords:** Cattle; Diarrhoea; Ethnoveterinary; Indigestion

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#### Introduction

The ethnoveterinary due to traditional therapeutics (plants, animals, and minerals) prepared by humans for the treatment of

animals or maintain their health condition [1] Traditional methods of treatment for animal diseases, particularly non-infectious diseases, occupy a special place in the history of the Croatian veterinary profession [2] Medicinal plants and their preparations have been used in

medicine since the first civilizations emerged. Also, traditional veterinary practices are being at least as ancient as animal domestication. The history of pharmacy in Croatia has an extremely rich and long tradition [3]. Traditional knowledge of plants and their preparations used to treat animals is less known because written trails are very rarely left. This knowledge was passed down orally from generation to generation, as in other regions [4,5]. Croatia is a country with several types of climate (from the Mediterranean, moderate to mountain climate) [6]. Depending on the climatic area and type of livestock through the centuries, different medicinal plants and preparations for the treatment of humans and animals were used. Unfortunately, only a few elderly people know how to apply a particular herb for therapeutic purposes and particular animal diseases. Consequently, there is very little scientific knowledge about veterinary phytotherapy, today. The practice of ethnoveterinary has often been prohibited by law during the development of the modern veterinary profession and culture. In the area of the hills of Bilogora, many species of plants are growing. The inhabitants of the surrounding villages are well aware of the environment and plants that grow on the meadows, in the forests and wetlands of this area. Hazelwort or European wild ginger (*Asarum europaeum* L.) is a species of flowering plant in the family *Aristolochiaceae*. Hazelwort has a wide distribution in Europe. There are two recognised subspecies *A. europaeum* ssp. *caucasicum*, and *A. europaeum* ssp. *italicum* [7]. The hazelwort contains essential oils with azaron and flavonoids, mucous substances, starch and some substance similar to the camphor [8]. Flax (*Linum usitatissimum* L.) is known as a plant since prehistoric times and later was the most important textile plant. Flax seeds or linseed were bred even in Babylon, 5000 years ago [9]. According to [10] flaxseed contains omega and palmitic fatty acids, some B vitamins, and minerals. Linseeds are used as a mild laxative because they contain mucilaginous polysaccharides which produce a protective layer on mucous membranes [11,12]. They may

be effective for the treatment of gastrointestinal disorders, such as colic, digestion, tympany, and meteorism [12-14]. White willow (*Salix alba* L.) is a tree native to Europe and Central Asia which has been used as a pain relief remedy. The active extract of the willow's bark, called salicin, was isolated to its crystalline form in 1828 and separated the chemical derivative acetylsalicylic acid, also known as aspirin, an anti-inflammatory and antiphlogistic medication [15]. That active substance could be useful as adjunctive therapy for indigestion in cattle [1]. Common mallow (*Malva sylvestris* L.) is a perennial plant of the family *Malvaceae*. The major substances responsible for the therapeutic effects of mallow are mucilaginous heteropolysaccharides, coumarins, anthocyanin, malvin, malvidin, polyphenols, vitamins (A, C, E), and tannins found mainly in leaves, flowers, and roots [16,17]. It possesses antioxidant, anti-inflammatory, wound healing, antinociceptive, and antimicrobial activities [18] Chamomile (*Matricaria recutita* L.) is well known and well documented in scientific medicinal literature and ethnoveterinary surveys from Switzerland, Austria, southern Italy, and western Spain [19-22]. The major constituents of chamomile flowers are sesquiterpene-containing essential oil and flavones [23]. Broad-leaved dock (*Rumex obtusifolius* L.) is a perennial flowering plant in the family *Polygonaceae*, native to Europe and Western Asia. In different parts of the world became a serious invasive species. Dock leaves are an excellent source of vitamin A and vitamin C, as well as a source of iron and potassium. The root contains antraglicosids, crysophanic and brasidic acid, tannins, iron, calcium oxalate and vitamin K [24,25]. The dried bark of sweet chestnut (*Castanea sativa* Mill.) or common oak (*Quercus robur* L.) is used to treat cattle suffering diarrhea [1]. Astringent activity occurs due to tannins from the bark. Tannins are polyphenolic biomolecules that bind to and precipitate proteins and various other organic compounds including amino acids and alkaloids [26]. Tannic acid is brown, so in general, white woods have a low tannin and dark woods have

a high tannin content [27]. The aim of the study is to document the ethnoveterinary knowledge and practices for treating indigestion or diarrhoea in cattle on the Bilogora hills, which may contribute to a better understanding of the traditional plant uses for cattle treatment in this part of Croatia.

## Materials and Methods

### Ethnobiological and botanical data collection

This study was to investigate medicinal plants used for animals treatment during the last 10

years (2008-2018), as parallel worked as a veterinary practitioner. Individual and confidential interviews with farmers from Bilogora hills were conducted in eighteen villages of four municipalities (Đurđevac, Kalinovac, Kloštar Podravski, and Virje), Koprivničko-križevačka county, NW Croatia (Figure 1.). During daily veterinary work, some owners of domestic animals often admitted to the use of some of their natural preparations on a plant basis. They were interviewed, whoever was available and willing to participate in this study.



**Figure 1:** Map of Bilogora region in the northwestern part of Croatia.

### Data analyses

Data about farmers (gender, age, educational level), about animals on the farm (species, category and number of animals), about medicinal plants and their uses for animal treatment, were recorded. Detailed information about local plant name(s) and parts used for treatment, description of the plant, traditional recipes and special warnings, methods and instructions for use were recorded. Most of the plants were used as a single ingredient for a specific treatment. This article was presented only cattle-related traditional ethnoveterinary knowledge and treatment of indigestion or diarrhoea, on the Bilogora hills in NW Croatia.

### Results and Discussion

#### Sociodemographic profile of local farmers cattle breeders

In total, 121 farmers aged 18-77 were approached during the ethnoveterinary interview conducted in the Bilogora regions. Among these, 40.50% were men (N=49) and 59.50% were women (N=72). The majority of farmers (76.86%) were over 50 (N=93). Tested farmers aged 18-30 years were 4.13% (N=5), 31-40 years 9.92% (N=12), 41-50 years 9.09% (N=11), 51-60 years 18.18% (N=22), 61-65 years 30.58% (N=37) and older than 65 years 28.10% (N=34). Only 2 farmers completed

college education (but not in veterinary, biomedicine, agriculture, or related professions), 7 finished for bachelor's degree, 21 high schools, 84 primary schools, and 7 not completed even primary school. All participants confirmed that used once or more

times any of mentioned plants (flax, chamomile, hazelwort, broad-leaved dock, sessile oak or sweet chestnut bark, white willow, common mallow, and yarrow) to treat indigestion or diarrhoea in cattle (Table 1.)

**Table 1:** Number and percentage of tested farmers (N=121) that used specific plants for cattle treatments.

plant names			Farmers	
English	Latin	Croatian	N	%
Flax	<i>Linum usitatissimum</i> L.	lan pravi	104	85.95
Chamomile	<i>Matricaria recutita</i> L.	kamilica prava	117	96.69
Hazelwort	<i>Asarum europaeum</i> L.	kopitnjak šumski	69	57.02
Broad-leaved dock	<i>Rumex obtusifolius</i> L.	štavelj konjski	105	86.77
Sweet chestnut	<i>Castanea sativa</i> Mill.	kesten šumski	84	69.42
Common oak	<i>Quercus robur</i> L.	hrast lužnjak	110	90.91
White willow	<i>Salix alba</i> L.	vrba bijela	22	18.18
Common mallow	<i>Malva sylvestris</i> L.	gavez crni	47	38.84
Yarrow	<i>Achillea millefolium</i> L.	stolisnik obični	18	14.87

### Medicinal plants used for cattle indigestion treatment

In the last few decades, lower milk prices and higher veterinary costs forced the owners themselves to start treating the sick animals, as it used to be during the era before the use of antibiotics and other modern veterinary medicinal products. They invited veterinarians, only if their therapy was not efficient or successful. Most herbal preparations for treat bovine indigestion and diarrhea are used as decoction administrated orally (popular Croatian name: zalijevanje, Eng. “pour in”). Indigestion is a condition of impaired digestion in cattle and other ruminants caused by excessive feeding of grain. Symptoms may include anorexia, decreased or absent primary ruminal contractions and reduced amount of soft to watery and foul-smelling feces. For farmers, any absence or decrease of ruminal contractions, and reduced food intake were signs of indigestion. Hazelwort or European wild ginger has reniform or horse hoof-shaped leaves, about 10 cm wide with a pepper-like smell. Croatian name „kopitnjak“ meaning “like horse hoof“. All farmers had an identical recipe to prepare decocts of hazelwort with a

few variations in the number of fresh leaves (10-15) boiled in the metal boiler (25-50 L of water). When the decoction cooled, strained through gauge or sieve and administrated orally 10-20 L. This procedure repeated 2-3 consecutive days. Flaxseeds are one of the oldest crops. Their health benefits are well-known through the centuries. Farmers added a handful (about 5 tablespoons) of flaxseeds in 5-10 litres of water and boiled or lightly boiled until the water became slimmer. They strained the seeds and left the liquid to cool down before being administrated orally. Flaxseeds were available at the veterinary pharmacy, not raised in the fields. White willow (*Salix alba* L.) was a plant that was rarely used for gastrointestinal disorders in this study because less than 20% of farmers mentioned this plant and its medical purpose. They cut mainly fresh twigs and smaller branches with leaves for feeding cattle. According to [28] and few reports from Turkey and Italy, chewing of willow by sheep increases salivary production, which in turn could lead to a reactivation of rumination. Chamomile flowers, aerial and stable were used mainly as decoction or infusion for the treatment of digestive problems in cattle, especially diarrhea [29,30]. Depending on the strength and method

of preparation, chamomile tea or decoction is used for the treatment of different digestive problems in cattle. For cattle indigestion (without diarrhea) farmers in the Bilogora region used light chamomile tea. Poured a smaller amount of chamomile flowers with boiling water and left for a few minutes. They strained the chamomile flowers and about 5-10 L warm (not hot) tea administrated orally. Very often, in warm tea, they added 0.25-0.5 kg of bakery yeast and 1-2 tablespoons of baking soda. If cattle suffered from diarrhea, farmers prepared a decoction of larger quantities of chamomile flowers, aerials and stables boiled in the metal boiler (25-50 L of water) until part of the water disappeared. When the decoction cooled, strained through gauge or sieve and administrated orally 10-15 L. This procedure is repeated 2-3 days. Common mallow (*Malva sylvestris* L.) leaves and flowers were mostly administered orally and considered helpful for various digestive disorders, mostly for ruminal reactivation, meteorism, abdominal colic, constipation, diarrhea [31]. Yarrow may be effective for the treatment of gastrointestinal disorders in ruminants, such as indigestion, colic, tympany, and diarrhea [32] and in broilers as antibiotic and probiotic [33]. Similar dual purpose as chamomile, yarrow tea of flowers, leaves, and stems was used to treat indigestion, while decoction used for treat diarrhea in cattle [34,35]. The farmers in NW Croatia used chamomile, common mallow and yarrow for dual purposes, herbal tea to treat indigestion and decoction to treat diarrhea, similar to the previous authors.

### Medicinal plants used for cattle diarrhea treatment

The first choice of plants in most farmers to treat diarrhea in cattle is chamomile (64.46%) and broad-leaved dock (35.54%). Often on some farms, we can found dried whole stems of the broad-leaved dock that have dried in the shade and stand hanged somewhere in a dark place, hanging with the tips down. Farmers often cooked larger quantities of dried stems of a broad-leaved dock in the boiler for the

decoction, which gave to drink for all categories of cattle that suffered diarrhea [1]. In other parts of Croatia and Europe (Austria, Italy, Spain, and Switzerland) for the same purpose used other species of *Rumex* genus [13, 36,25,22,14,1,37]. mentioned that Swiss farmers used decoctions prepared from roots of a broad-leaved dock which were orally administered for treatment of gastrointestinal disorders. The bark of sweet chestnut (*Castanea sativa* Mill.) or common oak (*Quercus robur* L.) used to treat cattle suffering diarrhea, similar to [1]. Bark soaked in tap water and boiled few hours, left to cooled and administrated orally 10-15 L of decoction. Usually, farmers prepared a decoction of oak bark for cows, bulls and heifers. Rarely, farmers used a decoction of chestnut bark, but always for younger cattle (calves). A decoction of oak bark may acts drastically on the mucous membranes of the calves gut and often peeled off the mucosa layer of the intestine. Today, the trend is to reduce the use of antibiotics and other veterinary ready-made drugs, so the various local homemade herbal recipes are increasingly used as a successful alternative to the treatment of animals.

### Plant sources, remedy preparation and modes of administration

Almost, all mentioned plants used by farmers in the Bilogora region for cattle treatments picked in the wild, with the exception of flaxseed (and rarely purified finely ground chestnut bark) bought in (veterinary) pharmacies. Farmers used mostly leaves (about 57%), flowers and stems (more than 25%), bark (about 13%), and branches or seeds (5%) for herbal preparations. Plants collected by farmers in the forest (oak and chestnut bark, hazelwort), on the meadows (yarrow, chamomile, and broad-leaved dock), in the waste ground (common mallow) and near swamps or creeks (white willow). A decoction is the extraction of the water-soluble substances of a drug or medicinal plant by boiling and then being left cooled. Although this method of extraction differs from infusion and percolation, the resultant liquids are often functionally similar. The term herbal tea or herbal infusions



refers to warm drinks or infusions of parts of the plant. All herbal preparations for bovine indigestion and diarrhea treatment are used as a decoction or as herbal tea (only chamomile, common mallow and yarrow) and administered orally in the amount of (5)10-15 litres or more.

### **Comparison of use between ethnoveterinary and ethnomedicine**

Chamomile has been used for centuries in human medicine. It has been reported to have anti-inflammatory and antioxidative activity. Chamomile is used to treat wounds, skin, ear and eye infections, ulcers, burns, etc. Also, chamomile has been used to reduce anxiety, nightmares, sleeping disorders, to treat various gastrointestinal disorders as a digestive relaxant [38,39]. Willow bark extract has been used for a long time as an anti-inflammatory and antipyretic preparation. The active extract of the willow's bark, called salicin, was isolated to its crystalline form (aspirin) as a non-steroidal anti-inflammatory drug [15]. Also, other active substances (other salicylates, polyphenols, and flavonoids) are important for the therapeutic purposes of willow bark [40]. Sweet chestnut (*Castanea sativa* Mill.) is a known source of condensed and hydrolysable tannins [41]. The combination of tannins may be relevant to treat diarrhea. Tannins have antibacterial, antiviral, and antispasmodic activity [41,42]. Oak bark has been used in European folk medicine since Middle Ages for treatment of gastrointestinal disorders and skin inflammations [43]. Yarrow is an important species used in the traditional medicine of European and Asian cultures for the treatment of gastrointestinal disorders, gynecological disorders and wound healing [44]. Linseed may be effective in animals for the treatment of many gastrointestinal disorders such as colic, digestion, tympany, obstipation, and meteorism. Also, in human phytotherapy, linseeds are well-known for the treatment of similar gastrointestinal disorders. It can be used as a nutritional supplement grounded into a meal or turned into linseed oil, to raise high-density lipoprotein content, and for treating heart problems, reduction of diabetes mellitus,

arteriosclerosis and cancer [10,45,46]. The young leaves of the broad-leaved dock can be used as a salad in moderate amounts because they contain oxalic acid. A few decades ago, people from this region, especially children, when went to pasture with livestock, harvested the young leaves of a board-leaved dock, chewed and ate. Once the plant matures it becomes too bitter to consume. The root of the broad-leaved dock is often used for treating anemia, due to its high level of iron. Both the leaves and roots may be a mild laxative. Flowers, leaves and aerial parts of common mallow have been reported to have anti-inflammatory and antioxidant activity, also, used to protect the gastric mucous, and as a laxative in humans [30]. The healing properties of the hazelwort in humans were written by famous herbalists from the Middle Ages (nun Saint Hildegard of Bingen, Albertus Magnus, etc.) as effective preparation for the treatment of respiratory diseases (asthma, cough, catarrhal laryngitis, etc.), intestinal constipation, diseases of the kidneys, headaches, fever and many others. Doctors do not use this plant anymore, but in Switzerland officially recognized as medicinal. It is well known that the whole plant in a fresh state is poisonous. Symptoms of hazelwort poisoning in humans are: nausea, vomiting, pain in the stomach and kidney, diarrhea, paralyzes the central nervous system. In severe cases of onset and death, if it is taken in larger quantities [47]. Most of the farmers (90.9%) confirmed that hazelwort is a poisonous plant for humans.

### **Conclusion**

Unfortunately, traditional knowledge of medicinal plants and ethnoveterinary practices, from the continental part of Croatia, may disappear soon. This is the first documentation of ethnoveterinary knowledge and using medicinal plants for indigestion or diarrhoea treatment in cattle on the Bilogora hills, northwestern part of Croatia. All farmers confirmed that used once or more times any of mentioned plants (flax, chamomile, hazelwort, broad-leaved dock, common oak or sweet



chestnut bark, white willow, common mallow, and yarrow) to treat indigestion or diarrhoea in cattle. Some herbs such as chamomile, common mallow and yarrow are used for dual purposes, herbal tea to treat indigestion, and decoction to treat diarrhoea. Documenting and preserving that tradition and scientific verification of recipes are of crucial importance for the next generations [48-51].

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