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Disease prevention in chemistry, biology and safety classes (by studying the properties of the cyclamen plant as an example)

Abstract

Current chemistry, biology, and bacteriology classes at school on the preparation of rudimentary remedies for disease (by studying the cyclamen plant as an example) are reviewed. Useful skills in herbal medicine can be taught successfully to students. The study of practical issues of personal safety increases the interest of young people in learning.

Keywords: prevention of colds, cyclamen, integrated lessons, ways to prepare medicines from plants

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Introduction

In times of social crises, pandemics and military conflicts, it can be very expensive and sometimes impossible to use pharmacy remedies due to logistical and financial problems. This describes the lack of medication in Sudan during covid-19. Similar problems are encountered in some other countries.[1] At the same time, there are dozens of available remedies that are always at hand (salt, soda, vinegar, and soap) and under feet (useful plants, sea water, mud, clay, minerals). We believe that many useful skills in herbal medicine can be taught successfully to students. There are many free specific descriptions on the Internet for their use in common injuries and illnesses. Here, for example, is a small part of a huge list of useful plants included in the pharmacopoeias of many countries as medicines (Table 1).

Table 1 Herbs and their properties

Herbs	Properties
Calendula (Marigold)	Gastrointestinal Treatment
Hypericum	Heals gastrointestinal ulcers, improves appetite, stomach and intestinal function
Chamomile Matricária	antipyretic; against headaches, stomachaches and extremities
Hellebore Chelidónium	Diuretic, diuretic, lowers blood pressure, heals wounds, relieves pain and itching
Rosehips Chelidónium	Acidifies, contains many vitamins, reduces inflammation and improves digestion
Wormwood Artemísia absínthium	Strengthens the stomach, fights parasites, improves digestion
Horsetail	Heals wounds, sores, fights tumors, strengthens the gastrointestinal tract and relieves intestinal disorders
Oreganum	Antimicrobial
Peppermint	Strong analgesic, increases gastric secretion Combats nausea, vomiting and liquid stools.
Yarrow flowers	Tonic property, reduces flatulence, increases bile secretion
Flax seed	Relieves pain and protects gastrointestinal mucosa, anti-inflammatory
Sage	In fever relieves intracranial pressure, expels phlegm Plantain
Plantágo	Seals damaged mucous membranes, protects the kidneys
Ginger	Sweating tonic, strengthens blood vessels
Lipa	Antipyretic, detoxifying, reduces coughing pains
Valerian	Calming, mild laxative, lowering blood pressure, improving immunity
Elecampane	High Anti-inflammatory, helps to quit smoking
Nettle	Relieves cramps, diuretic, choleretic, anti-inflammatory
Coriander	Helps with allergies, works well with the gastrointestinal tract, strengthens the immune system

The *Pharmacopoea Collegii Regii Medicorum Edimburgensium* was published by the Royal College of Physicians of Edinburgh as early as 1699, and in 1864, merged with the London and Dublin Pharmacopoeias to form the British Pharmacopoeia.[2]

Unfortunately, the centuries-old military and peasant experience of surviving infections is almost lost, although it is undoubtedly a world historical treasure. Knowledge and skills on current practical survival issues should be taught more often and more to students in safety,

biology, and chemistry classes. This increases interest in learning in school and increases human resources to fight viruses, bacteriological hazards, and radiation.

We encourage regular schools to make more use of the experiences of colleges, technical schools, and other vocational schools. It would be useful for national security if, in addition to the traditional high school diploma, school leavers were to have other certificates of mastery of a number of relevant competencies, such as a driving license, a profession certificate as an electrician, nurse, cashier, cook, laboratory technician, mechanic, paramedic, volunteer lifeguard, and so on (two or three at a choice).

Graduates who have received such certificates note that they have come in handy in their lives and have filled the study of school subjects with practical content and improved their understanding (Figure 1).

Figure 1 Graduate who have received certificates.

The Moscow State Public School named after Vladimir Mayakovsky has accumulated useful experience in such work. For example, in the 9th grade (in Russia there are 11 classes) almost half of the schoolchildren aged 15-16 voluntarily take an additional course in the specialty "Chemical Analysis Laboratory Technician".

The program is designed for 180 hours and includes subjects:

a) Fundamentals of Analytical Chemistry

b) Health and safety regulations

c) Basics of standardization

d) Preparation of chemical glassware, instruments and equipment

e) Preparation of samples and solutions

f) Environmental control

g) Processing and recording the results of chemical analysis

In 10th grade, students are offered a choice of courses in Nursing. Attending additional courses of study not only saturates the learning process with practicality, but also allows us to identify students who are inclined toward certain professions or scientific studies.

Let's look at an example from the teaching practice of the authors of this article:

The students were interested in learning what plant substances have medicinal properties. We decided to determine the benefits of the antimicrobial plant cyclamen and to compare homemade drops with drugstore drops. Cyclamen tubers can be poisonous, but also useful for upper respiratory diseases.

The following objectives for the students were formulated:

a) To analyze the information about this plant.

b) To get acquainted with diseases of the upper respiratory tract.

c) To compare information about preparations based on cyclamen.

d) Identify the bioactive substances in the juice of the cyclamen.

e) Prepare drops of a drug from the juice of cyclamen tubers.

f) Carry out a comparison of pharmacy and home remedies.

Research methods

a) Analysis-study of literature and Internet sources.

b) Determination of biologically active substances of cyclamen.

c) Preparation of an extract from cyclamen tubers and drops.

d) Visual analysis of the effects of the drops.

e) Comparison of pharmacy and home preparations based on cyclamen.

Plant description

Cyclamen (lat. *Cyclamen*), alpine violet, is an herbaceous perennial plant with a tuberous, thickened root. In nature, cyclamen serves as food for some animals, such as wild pigs. In the 18th century, cyclamen was called pig bread.

From the tubers we get a sap that has antimicrobial, anti-inflammatory properties. Cyclamen is used to treat adenoids and polyps. They occur in the nose and sinuses due to prolonged infections, allergens, immune disorders.[3]

Cyclamen is also used as an anti-hemorrhoidal, styptic, wound healing and sedative. Cyclamen is used as a basis for medicines, ointments, oils, tinctures, treating various pathologies of joints and vessels.[4] Central Europe, the Mediterranean, Asia Minor, Iran are considered to be native to the flower.[5]

A common disease is rhinitis. In unfavorable conditions (dustiness, dryness, low temperature, etc.) protective functions of the nasal passages mucous membrane are reduced or completely lost. Microbes and viruses are free to enter the cells of the mucous membranes, multiply and cause their death.

A more serious condition is sinusitis. In sinusitis, the sinuses of the nose become inflamed. When infection enters the sinus, mucus, which serves as a natural trap for germs and other contaminants, becomes thick and clogs the sinus openings. Due to poor air exchange, exudate accumulates in the sinuses. It is a favorable environment for the development of bacteria, which multiply in it and affect the mucous membrane of the sinuses. More detailed descriptions of rhinitis, sinusitis and many other diseases are widely available on Wikipedia and special medical websites.

The main substance in the juice of cyclamen i.e., a cyclamine, which in interaction with water, is converted into poisonous cyclamiretin. In addition to this substance, the sap contains a number of others that are saponins: cyclaminorin, deglucyclamin, cyclacumin and mirabilin lactone. The juice is also found to contain a high content of flavonoids and phenols (Table 2). Piperidine alkaloid, tannins and sterols were isolated in moderate amounts. The above-ground parts of the plant contain amino acids, proteins, reducing sugars, carbohydrates, cardiac glycosides and anthocyanins that give color to the plant.

Table 2 Uses, composition and prices of some drugs

Name	Composition	Scope of application	Price (Approximately in US dollars)
 Sinus forte	Cyclamen tuber extract: Lyophilizate of juice	➢ Water for injection - suppresses viral infections. ➢ relieves swelling ➢ Liquefies mucus in the maxillary sinuses	40
 Sinus Lift	Cleansing gel: plant extract, vitamin A sea water, aloe and calendula extracts	➢ flushes out mucus ➢ improves breathing ➢ restores nasal mucosa	40
 Neonox Forte Cyclamen	Cyclamen, aloe, calanhoe extract Sea buckthorn, eucalyptus olive oil Propolis	➢ prevents nasal mucus swelling in case of hypothermia or runny nose	20
 Cyclamenos	Cyclamen extract Essential oils of peppermint, Eucalyptus, tea tree and ginger	➢ the drug irritates the nasal mucosa ➢ drains pus ➢ relieves pain ➢ moisturizes tissues	10
 Phytonosol	Cyclamen extract Essential oils of peppermint, Eucalyptus, Mustard, olive and pine oil	➢ Covers the nasal mucosa with a thin layer ➢ Creates a mechanical barrier to infections ➢ expels mucus	10
 Oil drops	Cyclamen extract Grape seed oil	➢ more even distribution of the composition ➢ prevents the mucous membrane from drying out	10

Saponins and phenolic compounds are the main groups responsible for the plant's antimicrobial activity. Sugar chains stimulate the activity of saponins. The interaction of glycolin enzymes of saponins and fungal membrane sterols forms trans membrane pores, destroys the integrity and leads to membrane lysis. Tannins are isolated by the reaction of their interaction with divalent metal ions.[6]

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Determination of biologically active substances of cyclamen

For the experiment with tannins, we needed reagents: ink, methylene blue (blue); thin slices of cyclamen rhizome; a knife, tweezers, and a microscope. Pour a small amount of reagent into a container, and then use tweezers to dip a slice in it.

We put the slice soaked in the reagent under the microscope, we can observe the tannins. In the case of the ink reagent, they repel the ink by absorbing water, resulting in the formation of light areas. Methylene blue, on the other hand, completely stains the originally light cut and the tannins take on a bluer color than blue.

To prove the content of saponins, we needed to make a powder of the rhizome. To do this, we first finely grate the tuber, then squeeze the juice, but not all of it, and dry it. Next, using a mortar and pestle, we grind the dried pulp. The resulting powder (0.5 g) is placed in a test tube and pours warm water (10 ml). After the solution has cooled, shake the tube vigorously for 10 seconds. As a result, 1-10 cm high foam appears and does not disappear after addition of 2n HCl (1-2 ml). In our case, 5-6 cm high foam appeared and after adding HCl, it did not disappear.

Flavonoids and a number of other substances we determined by adding small amounts of reagents to the tuber juice: HCl+Mg; $AlCl_3$; $FeCl_3$; NH_3; Pb $(CH_3COO)_2$. The juice should be poured into the plate for drop analysis first, and then using a pipette add a different reagent to each cell.[7]

Preparation of drops from the plant

Before working, you need to wear protective gloves and goggles, because the juice of the cyclamen in its pure form is very poisonous (Figure 2). First we wash and peel the tuber, then grate it on a grater. We put the resulting mass on a cloth, roll it up and squeeze the juice into a container. Prepared juice drops have a high concentration, so dilute the juice with water in a ratio of 1:30. We add softening oils. Pour the solution into a bottle more convenient for use and store in the refrigerator. Shelf life: two weeks. It should also be stressed that such homemade remedies should not be used against medical advice or in favor of available approved medical interventions.

Figure 2 Preparation of drops from the plant.

Cyclamen drops in action. Volunteers (parents of students) agreed to help us test the drops. After an acute respiratory viral infection, some people constantly have a stuffy nose and leak mucus. You have to refrain from eating before the drops (there is a risk of vomiting). Lie on some surface with your back so that your head is hanging back down. Then drop 2-3 drops into the nasal passage and tolerate the burning. After a minute there is a powerful sneeze, and with it the mucus flows out. It is necessary to lie on his back for another 7 minutes, with his head thrown back. If one gets up too early, the drops will drip down the throat and into the stomach, causing irritation and vomiting. Cyclamen drops can provoke temporary swelling of the eyes, nasal mucosa. The patient chooses a convenient time: in the morning or in the evening. On the second or third day, pus will already begin to come out. After 7 days, mucus and pus were gone, nasal congestion disappeared, the condition improved. Most drugs remove mucus, relieve swelling and improve breathing.

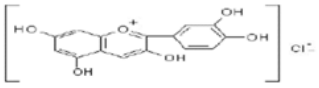
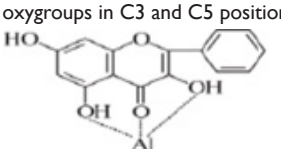
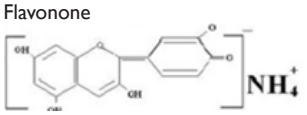
What is better: drugstore drops or homemade drops? A comparison of the composition of homemade and pharmacy drops showed their coincidence (Table 2). And to decide which drops to use, it is worthwhile only together with a doctor.

Conclusion

To prepare a medicinal product, you need to master the simple ways of working, as well as have knowledge of biochemistry. How many people in crises can improve their health using what is at hand? For example, many diseases will go faster if you put pieces of onion (garlic) in a sock or a salted towel on the patient's back at night.

Many plants are available: linden, raspberry, wormwood, nettle, plantain, chamomile (Table 3). You can make your own medicine when you don't have access to drugstore antibiotics and antivirals. Even simple decoctions or tinctures have medicinal properties. But you should always remember about the contraindications and mandatory consultations with your doctor.

Table 3 Determination of flavonoids and other substances

Reagents	Staining color	Substances
HCl^{+Mg}	Light Pink	 Presence of anthocyanins
$AlCl_3$	Dirty gray sludge	Presence of flavonoids with two oxygroups in C3 and C5 positions 
$FeCl_3$	Black sludge	Substances with an ordinary tri-oxy grouping in the B ring
NH_3	Yellow	The presence of flavones, flavonol, Flavonone 
$Pb(CH_3COO)_2$	Hasn't changed	Lack of halcons, aurons

To help your body in a difficult situation should be taught in school. We need to devote more hours to the practical preparation of

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adolescents for adult life. Learning about personal safety and health considerably increases young people's interest in learning.

It is time for parents, military officers, doctors and businessmen to conduct comparative analyses of the relevance and appropriateness of school materials and reduce exercises that have been obsolete for hundreds of years, to give graduates not only traditional knowledge, but also new competencies and technologies. These should be formalized with formal certificates (diplomas).

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Conflicts of interest

The author declares no conflicts of interest.

References

1. Lucero-Prisno DE, Elhadi YAM, Modber MAA, et al. Drug shortage crisis in Sudan during the COVID-19. *Public Health in Pract (Oxf)*. 2020,1:100060.
2. Bremen, Leipzig, Foerster IGL. *Pharmacopoeia of the Royal College of Physicians of Edinburgh*. 1722 (1st Ed). Royal College of Physicians of Edinburgh. Edinburgh, Scotland. 1722;OCLC:22778736.
3. Fomina MV. Inflammatory diseases of the upper respiratory tract. *Treatment and prevention-Orenburg*. 2007;28c.
4. Bokov DO, Krasikova MK, Sergunova EV, et al. Pharmacognostic, Phytochemical and Ethnopharmacological Potential of Cyclamen coum Mill. *Pharmacogn J*. 2020;12(1):1807–1815.
5. Gündogan T, Mammadov R, Ertem H, et al. Some phytochemical and microbiological studies on endemic species of Turkey Cyclamen Mirabile Hildebr and *Cyclamen Trochopteranthum* O. *CyberLeninka: Scientific electronic library.*2005;2C:55–59.
6. Cyclamen- Atlas of flowering plants.
7. Study of complex composition of rosehip fruits. Determination of organic acid. *Vizlit - Archive of student papers*. 2022.