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Pharmacognostic and Phytochemical Analysis of *Rumex acetosa*

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Abstract

Rumex is a group of 25 different annual plants that are well known in Poland and other places. The stem, leaf, root, seed, and fresh plant juice are the parts that are most often used in traditional medicine. . Plant chemicals like catechin, epicatechin, and epicatechin-3-O-gallate are found in *Rumex* juice. There are also propelargonidins (15 dimers, 7 trimers, and 2 tetramers) and procyanidins of the A and B types. [7-8]The healing properties of this plant come from the tannins it contains; it can be used to treat a wide range of illnesses. Previous studies have shown that *Rumex* can help fight cancer, viruses, high blood pressure, and free radicals.A lot of research has been done on how the genus *Rumex* can be used in medicine. The homeopathic method recognizes that this genus can be used as medicine. At least three species in this genus are used as homeopathic medicines. These are *Rumex acetosa, Rumex Crispus*, and *Rumex acetosella*. In this system of medicine, the medicine being studied hasn't been looked into very much. They have a wide range of medical uses, including fighting inflammation, free radicals, germs, and tumors.It had chloroform and ethyl acetate extract of *Rumex*, which did not have coumarin, but it did have alkaloids, saponin, tannin, polysaccharides, soluble starch, anthraquinones, and flavonoids. Soxhlet apparatus was used for successive solvent extraction of leaves of *Rumex.* Extracts obtained are black and semi-solid in consistency. 11.1 % is the highest % yield with AERA. All these extracts are screened for the presence of different phytoconstituents. Alkaloids, phytosterol, and flavonoids were found in PERA. It is important to mention that AERA contains all the phytoconstituents viz., alkaloids, carbohydrates, glycosides, tannins, phytosterols, proteins, amino acids, flavonoids, and anthocyanins.

Keywords- Catechin, Inflammation, Polysaccharides, Phytoconstituents, Flavonoids

Introduction

The annual plant *Rumex acetosa* lives for a long time and is in the Polygonaceae family, which has many different types of plants. *Rumex* is a group of about 200 kinds of plants that mostly live in the northern hemisphere, in places like Europe, Asia, Africa, and North America. They are annual, biennial, perennial, and sometimes shrubby. *Rumex* is a group of 25 different annual plants that are well known in Poland and other places. The stem, leaf, root, seed, and fresh plant juice are the parts that are most often used in traditional medicine. Today, both the above-ground and below-ground parts of many docks are used to treat illnesses and diseases. [1] People

have been using plants and herbs to treat illnesses for a long time. Because of this, *Rumex* (dock) species have become widely accepted because they are good for you and can heal.
You can grow sorrel, and the leaves are full of good things for you. There is too much oxalic acid in plant parts that make some nutrients, especially calcium, less accessible when they are not cooked. [2]. Many types of *Rumex* have been used as medicine for a very long time. They are very good at pulling out pain, stopping blood clots, and making muscles work better. Plant chemicals like catechin, epicatechin, and epicatechin-3-O-gallate are found in *Rumex* juice. There are also propelargonidins (15 dimers, 7 trimers, and 2 tetramers) and procyanidins of the A and B types. [7-8]The healing properties of this plant come from the tannins it contains; it can be used to treat a wide range of illnesses. Previous studies have shown that *Rumex* can help fight cancer, viruses, high blood pressure, and free radicals. However, there was no information on how the leaf water extract of plant, could help with depression. So, the goal of this study was to take antidepressant-producing substances from *Rumex* leaves and test them in a computer simulation. [9] The *Rumex acetosa* plant has been used in medicine and phytotherapy in Eastern Asia and many other places. People eat its leaves in salads and soups. Its healing value in treating a number of illnesses, such as high blood pressure and illnesses of the nervous, lung, skin, and digestive systems, has also been proven.[3] A lot of research has been done on how the genus *Rumex* can be used in medicine. The homeopathic method recognizes that this genus can be used as medicine. At least three species in this genus are used as homeopathic medicines. These are *Rumex acetosa*, *Rumex Crispus*, and *Rumex acetosella*. The homeopathy group knows a lot about the first two. In this system of medicine, the medicine being studied hasn't been looked into very much. [4] The parts that are most often used in traditional medicine are the top part, the fresh plant juice, the leaf, the root, and the seed. It's a plant that comes back every year.. This plant is also known as yard sorrel or sorrel. It grows in fields or gardens as a leaf veggie (pot herb). It has been possible to grow common sorrel for many years. The Latin word for "vinegary" is used in the species name, acetosa, to describe the plant's sour taste [5]. The taste of drug is like kiwi fruit or sour wild strawberries. You can blend them up and add them to soups, sauces, or salads. Oxalic acid gives the plant its bitter taste. [6]*R. acetosella* can be told apart from other plants because its leaves are shaped like arrowheads and its stalks are highly streaked and spiky with red. It also sprouts aggressively, and its tentacular rootstalk and flower come from a big vertical stem, while the female plant's blooms are brown [10]. So far, 268 chemicals from 29 species of *Rumex* have been made public. Tears, stilbenes, naphthalene, diterpene alkaloids, terpenes, anthraquinones, and flavonoids are some of the most important chemicals in plants. They have a wide range of medical uses, including fighting inflammation, free radicals, germs, and tumors [11]. In these tests, the hybrids had genes from both parents, but at different rates and with different shapes [12]. Tamarin leaves have been used in traditional methods and are now used because they contain a lot of tannins, which can help treat diarrhea and skin inflammation. A lot of researchers have also found that sorrel has a lot of bioequivalent chemicals and vitamins [13]. Plants of Rumex acetosa L. (RA) have been widely grown and utilized for a time as medicine, powder, and color. The Neolithic and Palaeolithic parts of this plant have been set up in sites all over Europe. His tree has recently become a very famous food that is used a lot in traditional cooking [14]. People with rheumatoid arthritis are treated with medicines that make them sweat, make them pee, kill germs, lower their body temperature, fight inflammation, fight bacteria, dull their pain, and fight viruses [15].

Common Name:
Docks, also known as sorrels, now belong to the genus *Rumex.* They are also known as sour weeds, garden sorrels, red sorrels, field sorrels, and sheep sorrels. There are a lot of different popular names for *Rumex* species, and some of them even sound like the same plant. The English name is garden sorrel.

Chemical compounds

We used a multistep process to remove the highly active products from the *Rumex* root and aerial part. The process involved the use of 19 different chemicals, including naphthalenes, anthraquinones and flavonoids (quercetin). Testing the antibacterial action of the isolated substances revealed that naphthalenes were particularly effective in killing certain types of germs. It had chloroform and ethyl acetate extract of *Rumex*, which did not have coumarin, but it did have alkaloids, saponin, tannin, polysaccharides, soluble starch, anthraquinones, and flavonoids.

Table.1 Medicinal uses of plant

Plant parts	Medicinal use	Phytochemicals present
Leaves and flower	Tumors	Polyphenols
Leaves and stem	Constipation, cramping and diarrhea	Tannins and phenolic acid
Fruits, leaves and roots	Skin infection, sore throat	Tannins
Roots and stem	Fever, ulcers, skin itch, kidney	Anthraquinones
Leaf	Fever, worm, blood cleaner, diabetics	Flavonoids

Material and methods

Rumex acetosa leaves were picked in December 2022. Samples of plants were checked out at the Botanical Survey of India.People choose SD Fine Chemicals Limited to get chemicals like petroleum ether, chloroform, ethyl acetate, and ethanol. All the chemicals used in the study are of the Laboratory Reagent type.

Methods

Extraction of *Rumex* leaves by using soxhlet apparatus

We gathered and verified the authenticity of *Rumex acetosa* plants. We checked the leaves for impurities, dried them, and ground them into a coarse powder. We then subjected them to a Soxhlet system of progressive solvent extraction. We used the following method for the soxhlet extraction: We defatted the plant material with 500 mL of petroleum ether at 55 °C, resulting in the production of petroleum ether extract of *Rumex acetosa*. We then extracted the plant material using different solvents: 500 mL of chloroform at 55–60 °C produced the chloroform extract of *Rumex acetosa*, and 500 mL of water at 65–75 °C produced the ethyl acetate extract of *Rumex acetosa*. We allowed the extracts to dry in the air for 140 hours, resulting in the formation of a semisolid form.

Phytochemical analysis of Rumex leaves with different extracts

To identify the presence of alkaloids, cardiac glycosides, tannins, phytosterols, proteins, amino acids, and flavonoids, preliminary phytochemical analysis was performed using standard methods

a) Estimation of total phenolic content:

In the Folin-Ciocalteu reagent, phenolics mix with phospho-molybdate, which is an oxidizing agent, when the pH level is high. This makes a blue complex called molybdenum blue, which can be measured at 650 wavelengths. We prepared a stock solution of the extract in methanol (1 mg/mL). A 25-ml volumetric flask was filled with the extract from the stock solution. Next, we added ten milliliters of water and 1.5 milliliters of FC reagent, and let the mixture sit for five minutes. Next, we added four milliliters of 20% Na2CO3 and distilled water until the volume reached 25 milliliters. It was held for 30 minutes. We recorded the absorption at 765 wavelength. We found the total phenolic content as gallic acid (mg/ml) based on the calibration curve, using the equation y=0.018x-0.047; R2=0.985; r2=, where y represents the absorbance and x represents the gallic acid equivalent (mg/ml).

b) Determination of total flavonoids:

A stock solution (mg/ml) was made by mixing the extract with methanol. We mixed 5 ml of the sample from the stock solution, which was an extract in methanol, with 0.5 ml of 2% AlCl3 in methanol. The standards are made using the same method with 0.2, 0.4, 0.6, 0.8, and 1 ml of the stock solution (quercetin solution). The yellow color shows that a blank of 2% AlCl3 in 0.5 cc of methanol was used. This container could hold 5 ml of mix. With methanol and this equation, we found out how much of the standard drug querctin was taken (mg/ml): y=0.007x-0.008; R2=0.988. In milligrams per milliliter, x shows how much quercetin is present, and y shows how muchistaken.

c) Determination of total tannin:

To get the oil out, we cooked 2 grams of dried plant matter in 100 milliliters of clean water for 6 to 8 hours. After that, we filtered the solution and put enough into the volumetric jar to fill it to 1000 ml. It took us 1 ml of the solution, 5 ml of the Folin and Ciocalteu reagent, and 10 ml of saturated sodium carbonate to mix them together. This process was kept up until the volumetric flask was full of 1000 ml of the blend. First, we got the gadget ready by taking a "blank" reading. Then, we used several samples to measure the absorption. With the UV-1 double beam spectrophotometer and the calibration curve, we found the tannin content (y=0.003x+x=0.021; R2=0.984) at 760 wavelength. The amount of tannic acid in mg/mL was given by x and its size was y. (Anonymous,1984).

Fourier transforms infrared spectrophotometer (FTIR)

According to the Fourier transforms infrared spectrophotometer (FTIR) is the best way to find out what kinds of chemical bonds and functional groups are in phytochemicals. We captured the spectrum using a Perkin-Elmer Spectrum 2 FTIR device, and then processed it on a PC using software. As you can see from the labeled spectrum, the chemical link's most important feature is the range of light it absorbs. You can figure out the chemical links in a substance by analyzing its infrared absorption spectrum (Kumar et al., 2014). Cheng et al. (2016) used a small amount of dried leaf methanolic solution as a test for FTIR, and the dried leaf powder as a second sample. Rout et al. (2016) used a precision of 4 cm1 to record infrared transmittance data over a range of 400 to 4000 cm1.

Result-

Extraction and phytochemical screening of *Rumex*leaves. The presence of a high number of physiologically active chemicals in several species of *Rumex* has made it important in medicine and the pharmaceutical sector. *Rumex acetosa*L. is a wild perennial plant, well known for the presence of many biologically active phytoconstituents. All the parts of the plant including the leaves are important sources of various therapeutic constituents. Soxhlet apparatus was used for successive solvent extraction of leaves of *Rumex.* Extracts obtained are black and semi-solid in consistency. 11.1 % is the highest % yield with AERA. All these extracts are screened for the presence of different phytoconstituents. Alkaloids, phytosterol, and flavonoids were found in PERA. It is important to mention that AERA contains all the phytoconstituents viz., alkaloids, carbohydrates, glycosides, tannins, phytosterols, proteins, amino acids, flavonoids, and anthocyanins. Many types of constituents including flavonoids are reported in aerial parts of plant [28]. Table 2 shows the presence of components in various extracts.

Table.2 Results of Physicochemical parameter

S.NO.	Physicochemical parameter	leaf powder results (%w/w)
1	Total Ash value	6.7
2	Acid Insoluble Ash	1.391
3	Water Soluble Ash	4.3
4	Loss on drying	0.97
5	Foaming Index	0.5
6	Swelling Index	0.9
7	Water Soluble Extractive Value	8.3
8	Ethanol Soluble Extractive Value	8.7
9	Foreign Matter	1.0

Table.3 Results of Phytochemical screening

S.no	Phytochemical	Test	Chloroform extract	Ethyl acetate Extract
1	Alkaloids	1. Mayers test	Present	Present
		2. Wageners test	Absent	Present
2	Carbohydrates	1. Molish Test	Present	Present
		2. Benidict Test	Present	Present
3	Tannins	**1.** Iodine Test	Present	Present
		2.Gelatin Test	Absent	Present
4	Flavonoids	1. Alkaline reagent test	Absent	Present
		2. Lead acetate test	Absent	Absent
5	Proteins and amino acid	1 Ninhydrin test	Present	Absent
		2.Millons Test	Present	Absent
6	Cardiac glycosides test	1. Legal test	Absent	Present
		2. Killerkallani test	Absent	Present
7	Anthocynins		Present	Present

TOTAL PHENOLIC CONTENT AND TANNIN CONTENT

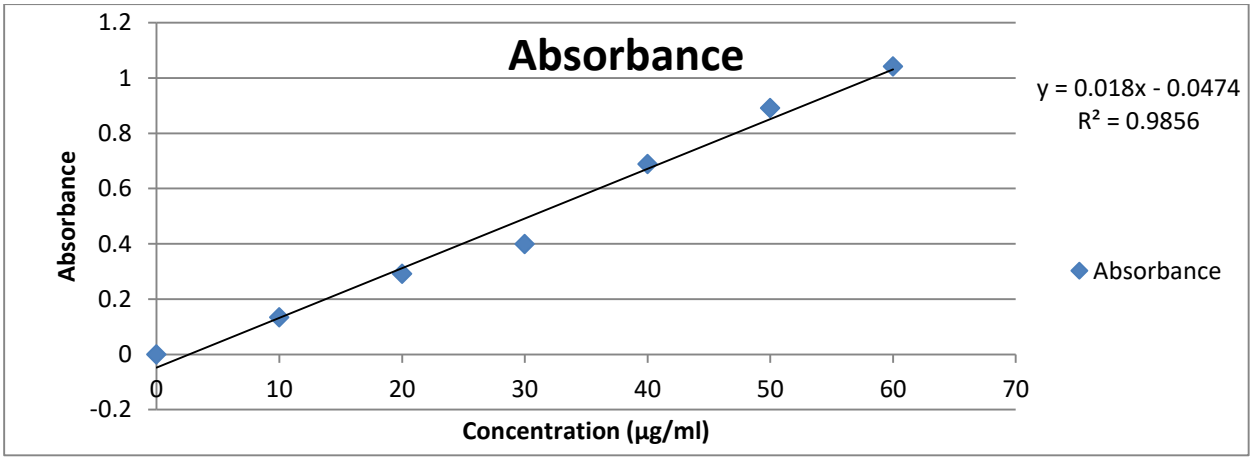

Fig. 1.1 Standard of Total phenolic Content of *Rumex* plant leaf

The total amount of phenolics in the extract was 82.4±0.5 mg gallic acid equivalent/mg of extract. The amount of total tannins was found to be 0.007 x 0.008 kg/mg of extract using the standard curve (R2 = 0.988). The total tannin content of the extract was 75.1±0.3 mg tannin equivalent/mg of durgshown in (Figure 1.1)

TOTAL FLAVONOIDS CONTENT

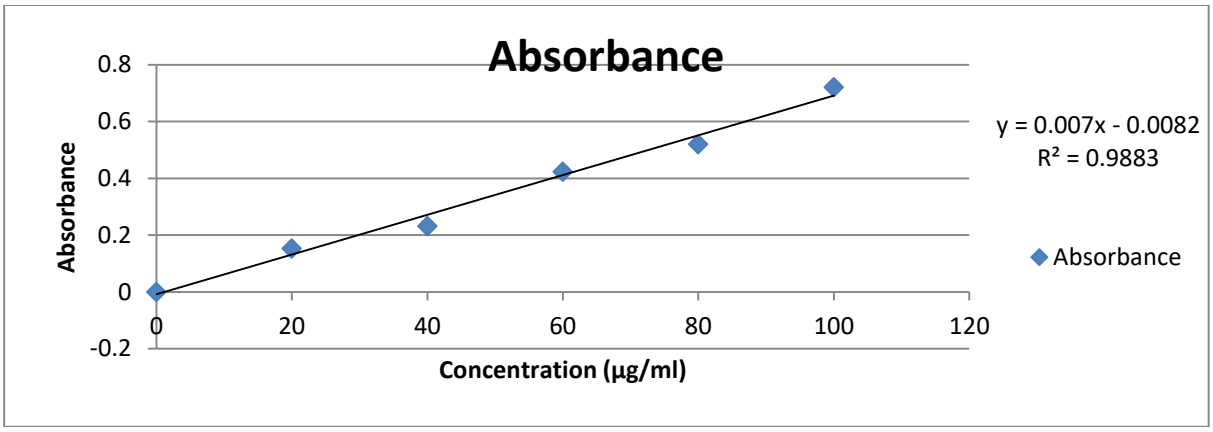

Figure 1.2Standard curve of Total Tannin Content of *Rumex* plant leaf

The total flavonoid content of the extract was 81.1±0.2 mg querctin equivalent/mg of extract. Plants typically produce flavonoid, which fall under the category of polyphenolic compounds. Flavonoid consists of various bioactivities, which may further enhance their anti-oxidant properties. The extract contains the total amount of flavonoid was shown in (Figure 1.2)

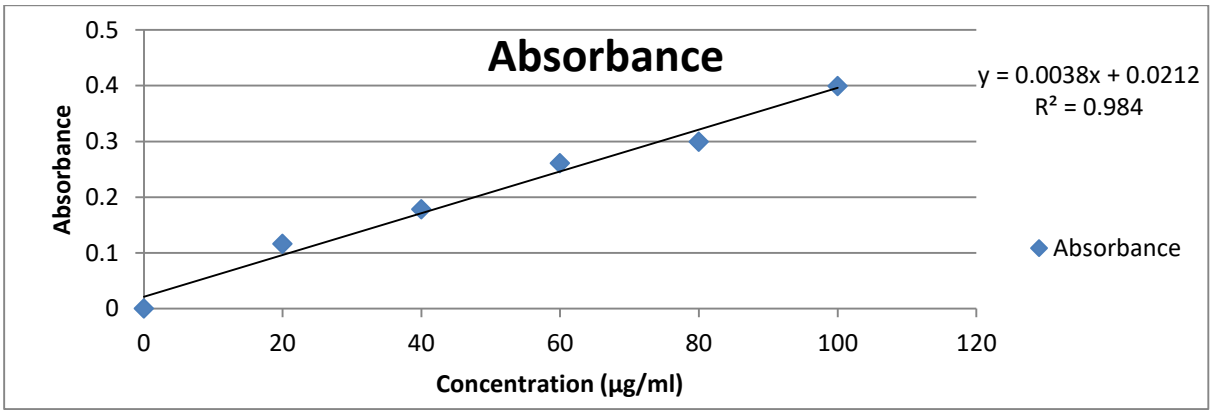

Fig.1.3 Standard of Total flavonoid Content of *R.acetosa* plant leaf

FTIR ANALYSIS OF CRUDE DRUG AND EXTRACT

FTIR spectra of the extract and powder of *Rumex acetosa* leaf. The FTIR spectroscopic investigation revealed distinct characteristic peaks for various functional groups in the extract and crude powder. The methanolic extract of *Rumex acetosa* displayed a characteristic band at 2917.28 for O-H stretching and 1625.72, 1013.77 for bending vibration. The plant extract underwent FTIR analysis at 3345.01, 2918.6 for O-H stretching, 2849.55, 1399.68 for CH3 bending, 1564.3 for aromatic C=C stretching, and 1056.98 for C-O stretching. We use FTIR method on a spectrophotometer system to identify the characteristic peak values for functional groups of compounds. Fig. 5.8 shows the absorbance bands and the wave number (cm1) of prominent peaks obtained from absorbance spectra.This technique primarily focuses on determining the functional groups within the phytochemicals present in the structure. FTIR spectroscopy, a valuable technique for analyzing various biomolecules, serves as a

significant approach for determination, identification, and authentication purposes, thereby preventing adulteration in herbal medicine.

Table 4 FTIR analysis of *R.acetosa*leaf powder

S.NO.	PEAK VALUE ($cm^{-1)}$	FUNCTIONAL GROUPS
1	2917.28	O-H stretching
2	1625.72	C-H bend
3	1013.77	C-H bend

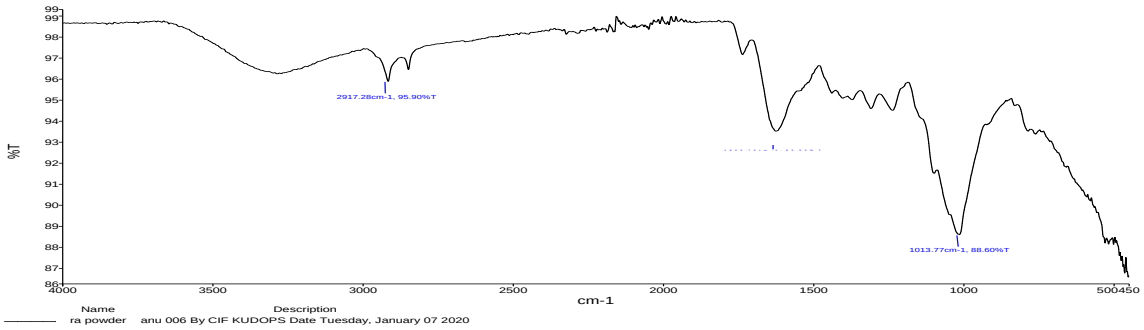

Figure. 1.4 FTIR spectra of *R.acetosa*leaf powder

S.NO.	PEAK VALUE	FUNCTIONAL GROUP
1	3345.01	O-H stretching
2	2918.6	O-H stretching
3	2849.55	C-H stretching
4	1564.3	Aromatic C=C stretching
5	1399.68	CH3 bending
6	1056.98	C-O stretching
7	491.36	C-I stretching

Table 5 FTIR analysis of *R.acetosa*leaf extract

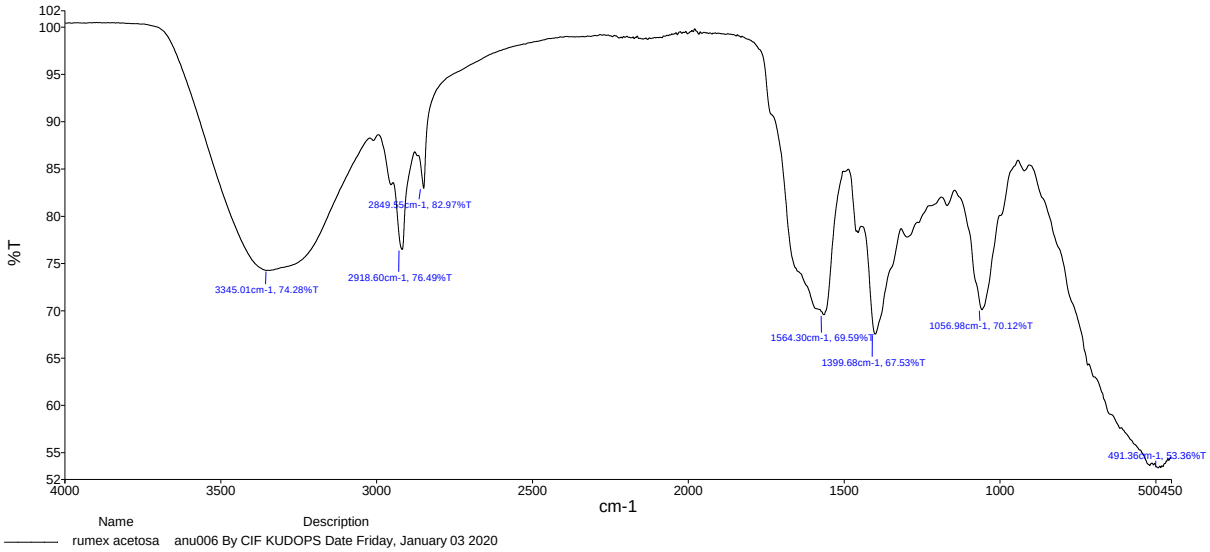

Figure 1.5 FTIR spectra of *R.acetosa*leaves extract

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