**Arnica montana L.**

**Scientific name:** *Arnica montana* L.  
**Synonyms:** *Arnica montana* var. alpina L. *Arnica montana* var. angustifolia  
**Family:** Asteraceae  
**Genus:** Arnica  
**Species:** montana  
**Common Name:** Wolf's bane, Leopard's bane, common Arnica, Mountain arnica, Mountain daisy, Mountain tobacco.  
**Parts Used:** Flower heads either fresh or dried, rhizome  

**Plant Description:** “*A. montana* is a flowering plant about 18–60 cm (7.1–23.6 in) tall aromatic fragrant, perennial herb. Its basal green ovate-ciliate leaves with rounded tips are bright coloured and level to the ground. In addition, they are somewhat downy on their upper surface, veined and aggregated in rosettes. By contrast, the upper leaves are opposed, spear-shaped and smaller which is an exception within the Asteraceae. The flowering season is between May and August (Central Europe). The hairy flowers are composed of yellow disc florets in the center and orange-yellow ray florets at the external part. The achenes have a one-piece rough pappus which opens in dry conditions. *A. montana* is a hemicryptophyte, which helps the plant to survive the extreme overwintering condition of its habitat. In addition, *Arnica* forms rhizomes, which grow in a two year cycle: the rosette part grows at its front while its tail is slowly dying”.

** Constituents:** *Arnica* contains arnisterol, thymol, inulin, helenalin, betuletol, eupafolin, hispidulin, isorhamnetin, luteolin, patuletin, spinacetin, tricin, kaempferol, quercetin, jaceosidin, pectolin, arigenin, arnidiol, foradiol, arnifolin, arnicolide, dihydro-helenalin, betaine, choline, trimethylamine, coumarin, scopoletin, umbelliferone, arabino-3,6-galactan protein, fucogalactoxylo-glucan, palmitic, linoleic, myristic, linolenic, arnicin, caffeic acid, α- and β-carotene, cryptoxanthin, lutein, anthoxanthine, isorhamnetin.

**Reported chemical constituents present in *Arnica montana* L.**

![Helenalin](image_url)  
![Thymol](image_url)  
![Betuletol](image_url)
Arnifolin

Arnicolide

Dihydrohelenalin

Betaine

Choline

Trimethylamine

Coumarin

Scopoletin

Umbelliferone

Palmitic acid

Linoleic acid

Linolenic acid

Myristic acid
Caffeic acid  \[\text{β-carotene}\]

\[\text{α-carotene}\]  \[\text{Lutein}\]

\[\text{Cryptoxanthin}\]  \[\text{Anthoxanthine}\]

\[\text{Isorhamnetin}\]

**Medicinal Uses:** antiseptic, anti-inflammatory, antibacterial, decongestive and antifungal properties. It also stimulates the forming the granular tissues and thus accelerating the healing process.

**Side Effects & Toxicity:** Arnica causes dizziness, tremors, and heart irregularities. Other possible side effects may include vomiting, muscle weakness, and an increased risk of bleeding. The plant is poisonous and ingestion may cause gastroenteritis, dyspnea, cardiac arrest, and death. There are a number of case studies documenting skin reaction to the use of *Arnica montana* herb or extracts which range in severity from itchy erythema to contact dermatitis in a delayed type of allergic reaction.

**Contraindications:** Hypersensitivity to the active substance and to other plants of the Asteraceae family.

**Range of application:** Oral use of Arnica is considered unsafe. Topical use of arnica on broken skin and open wounds is also considered unsafe. Arnica is contraindicated in those who are
allergic to it or who have known allergies or hypersensitivity to other members of the daisy family, such as chamomile and marigolds. Contact dermatitis also has occurred. It is contraindicated in pregnant women and nursing mothers. Apply a thin layer on the affected area, two to four times daily.

**Incompatibilities with other medicaments:** Arnica may potentiate the adverse effects of drugs known to cause a prolonged QT interval. Such drugs include quinidine, procainamide, disopyramide, sotalol, amiodarone, chlorpromazine, prochlorperazine, haloperidol, pentamidine, amitriptyline, desipramine and doxepim. Arnica may potentiate the cardiotoxicity of such drugs as doxorubicin. Arnicamay potentiate the cardiotoxicity of such drugs as doxorubicin.

**Dosage:** Adolescents, adults and elderly.

a. Semi-solid dosage form (21.5% tincture in ointment base) Apply a thin layer on the affected area, two to three times daily.

b. semi-solid dosage form (20% tincture in base) Apply a thin layer on the affected area, two to three times daily.

c. semi-solid dosage form (50% liquid extract in base) Apply a thin layer on the affected area, two to four times daily.

The use in children under 12 years of age is not recommended.

**Uses:** The European Commission approved the external use of arnica flower for injuries and for consequences of accidents, e.g., hematoma, dislocations, contusions, edema due to fracture, rheumatic muscle and joint problems. It is also approved for use in inflammation of the oral and throat region, furunculosis, inflammation caused by insect bites, and superficial phlebitis.

Internal and external preparations made from the flowering heads of Arnica have been used medicinally for hundreds of years. Alcoholic tinctures were used by early settlers to treat sore throats, as a febrifuge, and to improve circulation. Homeopathic uses included the treatment of surgical or accidental trauma, as an analgesic, and in the treatment of postoperative thrombophlebitis and pulmonary emboli. It has been used externally for acne, bruises, sprains, muscle aches, and as a general topical counterirritant. Arnica has been used extensively in European folk medicine. Arnica's bactericidal properties were employed for abrasions and gunshot wounds.

**Action of herb:** Treating the pale face skin complexion, wounds, bruises, superficial phlebitis, insect bites and burns, dislocations, bacterial infections, skin cancer, bronchitis, tonsillitis, pharyngitis, flu, lung cirrhosis, cystitis, nephritis, kidney infections, coronary insufficiencies, hypertension, breastplate angina, cerebral trauma, headache, paresis, semi-paresis, insomnia, heart palpitations, depression, neurosis, hysteria, anti-inflammatory for leg ulcers treatment in diabetics’ patients.

*a. montana* is use to heal surgical incisions and as an anesthetic to reduce pain during surgery, including dental procedures; migraine and tension headache. Arthritis, eczema, acne, pains caused by childbirth, post-operative thrombophlebitis and pulmonary emboli. *A. montana* is also used as a hair tonic, for dandruff treatment, in perfumes and cosmetics.
Microscopic examination of *A. montana* flower

The following diagnostic characters were observed in *A. montana* powder: stomata and trichomes are found on the epidermises of the bracts of *A. montana*; uniserate, secretory and multicellular trichomes were observed. The epidermis of corolla contains lobed or elongated cells with few stomata and trichomes of different types (covering and secretory). The epidermis of the ovary is covered with secretory and twinned covering trichome. The epidermis of calyx consists of elongated cells with unicellular and short covering trichomes directing towards the upper end of the bristle. The pollen grains are rounded with a spiny exine and three germinal pores (British Pharmacopeia 2011) See figure below.

![A. montana and its diagnostic characters](image)

**Figure: A. montana and its diagnostic characters**

**Physical and Chemical Properties of Flower Extract:**

Physical state: Viscous liquid
Color: Dark brown
Odour: Characteristic
Flash point: > 100°C
Density: < 1 g/cm³ pycnometer
Solubility in water: Insoluble
Solubility in other solvents: Good solubility in fat phases
Solvent Content: No solvent residues

GC/MS analyses were performed using HP 5890II chromatograph interfaced with an HP 5971 mass spectrometer and equipped with a Sil B CB capillary column. The oven temperature was kept at 60°C for 2 minutes then programmed from 60° to 160°C at a rate of 5°C/min, kept for 1 min and then increased up to 280°C at the rate 10°C/min and kept at the final temperature for 3 min, using Helium as a carrier gas. The injector and detector temperatures were 250°C. The percentage composition of the oils was computed from GC peak areas without correction factors. The qualitative analysis was based on a comparison of retention times, indices and mass spectra with the corresponding data in the literature and computer mass spectra libraries. Three repetition of the analysis were performed.

Fifty-six identified constituents, two of them tentatively and two geranyl linalool isomers with a query comprised 70% of total oil content.

**Chemical Identification Tests of A. montana**
The following chemical classes were found present in *A. montana* extract that is, tannins, carbohydrates and sterols.

**Thin-layer Chromatography of A. montana**
TLC of extract of *A. montana* was performed in chloroform – methanol – water (80:20:2) solvent system and the Rf value of the spots were calculated at 254nm were 0.03, 0.07, 0.17, 0.26, 0.30, 0.36, 0.47, 0.74 and at 365nm were 0.04, 0.11, 0.19, 0.29, 0.42, 0.54, 0.67, 0.76, 0.80. In ethyl acetate – methanol – water (100:16.5:13.5), the Rf values at 254nm were 0.01, 0.11, 0.15, 0.23,
0.30, 0.35, 0.39, 0.56, 0.60, 0.66, 0.74 and at 366nm were 0.03, 0.11, 0.22, 0.33, 0.39, 0.45, 0.57, 0.67, 0.74.

**High Performance Liquid Chromatography of A. montana**
HPLC analysis of arnica extract showed several peaks, among which 8 peaks were prominent at retention times of 2.232, 2.913, 14.386, 27.874, 28.919, 30.441, 31.416 and 32.443 minutes.

**Fourier Transform Infrared Spectroscopy of A. montana**
A. montana extract exhibited significant peaks in FT-IR spectrum at following wavelengths: 3300 (OH), 2929.40 (C-H), 1740.30 (C=O), 1634.05 and 1519.64 (aromatic ring), 1164.13 (C-O-C) cm⁻¹.
Insecticidal activity of *A. montana*

Dose dependent increase in insecticidal activity was observed from 1-100mg doses. On exposure to 100mg of *A. montana* extract, 10±2.70, mean mortality time was recorded.

Anthelmintic activity of *A. montana*

Earthworms showed strong repelling effects towards the drug. Earthworms showed hyper motility for 8-12 hours after the exposure of the drug and were normally active even at the end of 24 hrs. Earthworms remain very active and gave very active response on touch even after 5-6 hours of exposure of 100mg *A. montana*. The mortality time was found to be 24±0 on the exposure of helminthes to 100mg of *A. montana* at the end of 24 hours.

Molluscicidal activity of *A. montana*

This activity showed a dose dependent effects when snails were exposed to different doses such as 1, 25, 50, 75, 100 and 500 mg of *A. montana* extract. In 1000mg dose a paralytic effect was observed at 24±0 hours with shell discoloration while six snails were found dead in 48 hours in the same dose.

Anti-bacterial activity of *A. montana*

Zone of inhibition of *A. montana* extract was found (20±2) against *S. pyogenes* (gram-positive bacteria), while other showed insignificant zone of inhibition. Minimum inhibitory concentration (MIC) of *A. montana* is 22mg/ml against the gram-positive bacteria, *S. pyogenes* and 24 mg/ml against gram negative bacteria, *E. coli*, lower dose than standard drug, Ampicillin.

Anti-oxidant activity of *A. montana*

*A. montana* extract (5 mg) exhibited 71.52% DPPH scavenging activity and 63.68% total anti-oxidant activity at 5 mg.

Effects of *A. montana* on locomotor and exploratory behavior of mice

The anxiolytic activity was assessed by open field, head dip and stationary rod method. The most significant CNS depressive effects were observed at the dose of 100 mg/kg of *A. montana* extract. In open field activity the results were found 11.33±1.73 counts in 30 minutes. In head
dip test, the mice dipped head 24±2.65 times. Number of entries in light compartment is 5.5±1.51 times. The reading of cage cross is 24.67±2.41 times. In forced swimming test (FST) the Mean forced mobility time was 1.78±0.12 seconds. Mean time of mobility on stationary rod was 12.5±0.83 seconds. Locomotor and exploratory activity was observed substantially reduced in comparison to control and standard, Diazepam (2 mg/kg\(^{-1}\)).

**Analgesic activity of A. montana using Acetic acid**
Analgesic activity was widely assessed by acetic acid induced abdominal constrictions method. The writhes were counted for three phases, each of 10 minutes respectively. The inhibition of acetic acid induced writhes by Aspirin was as follows; first phase; 66.7%, second phase; 32.2%, third phase; 35.5%. Whereas A. montana extract, at the dose of 100mg/kg exhibited maximum inhibition (57.6 %) in third phase.

**Analgesic activity of A. montana using Formalin**
Animals exhibited the prominent results on introduction of extract of A. montana upon comparison with standard drug (Aspirin – 300 mg/kg body weight). The analgesic effect of aspirin in phase 1, 2 and 3 was 21.7%, 84.3% and 22.8% respectively.A. montana showed maximum inhibition of the licking and biting response (76.1%) induced by formaldehyde at the dose of 50mg/kg in second phase.

**Carrageenan induced anti-inflammatory activity of A. montana**
A. montana (300mg/kg) exhibited maximum paw inhibition 18.75% at 1 hour. A. montana (500mg/kg) revealed 25.71% paw volume inhibition at 4.5 hours. Aspirin at 1.5 hours had maximum paw volume inhibition 22.22%.

**Effects of A. montana on hematological parameters of male rabbits blood**
In male test group treated with A. montana extract all blood parameters; hemoglobin (11.835±0.0739), RBC count (5.7235±0.00836), Hematocrit (40.35±0.0836), MCV (70.35±0.0836), MCH (20.35±0.0836), MCHC (29.23±0.0836), WBC count (9.25±0.0836), Platelet Count (526.83±0.658) were found elevated in comparison to male control group.

**Effects of A. montana on hematological parameters of female rabbits’ blood**
In female test group in comparison with the female control group, hemoglobin (10.96±0.0408), RBCs (5.82±0.0063), MCV (66.75±0.0836), hematocrit (38.835±0.0739) MCH (18.835±0.07395), MCHC (28.316±0.0658), and platelet count (327.67±0.7302) were found lowered, while white blood cells (7.15±0.0836) count were found elevated.

**Effects of A. montana on Kidney Function Test of male rabbit’s blood**
In male test group treated with A. montana extract exhibited urea (29.08±0.63), serum calcium (14.94±0.0203), albumin (4.645±0.0083) and A/G ratio (1.795±0.0083) were found elevated. Whereas, creatinine (0.775±0.0083), phosphorus (4.73±0.017), uric acid (0.08±0.006) total proteins (7.235±0.0083) and globulin levels (2.585±0.0083) were lowered in comparison to rabbit’s male control group.

**Effects of A. montana on Kidney Function Test of female rabbit’s blood**
Female test group treated with A. montana extract exhibited raised levels of creatinine (0.98±0.024), serum calcium (15.17±0.009), uric acid (0.065±0.0083), total protein
(8.275±0.008) and globulin (2.771±0.019), whereas, urea (55.08±0.63), phosphorus (3.405±0.0083), albumin (5.515±0.0083) and A/G ratio (1.94±0.025) were found lowered when compared to rabbit’s female control group.

Effects of *A. montana* on Cardiac Enzymes of male rabbit’s blood

CPK (818.5±0.83) and CK-MB (473.5±0.83) enzymes were observed raised while LDH (135.5±0.83) level was found lowered in male test group treated with *A. montana* as compared to male control group.

Effects of *A. montana* on Cardiac Enzymes of female rabbit’s blood

LDH (130.5±0.83), CPK (675.5±0.83), CK-MB (378.83±18.81) enzymes were observed lowered in female test group treated with *A. montana* extract in comparison to female control group.

Effects of *A. montana* on Lipid Profile of male rabbit’s blood

Cholesterol (13.5±0.83), triglycerides (67.5±0.83), HDL (5.5±0.83), LDL (2.83±0.65), VLDL (12.5±0.83) were observed lowered in male test group treated with *A. montana* as compared to the male control group.

Effects of *A. montana* on Lipid Profile of female rabbit’s blood

In female test group treated with *A. montana* extract in comparison to female control group, lipid profile parameters were found elevated; cholesterol (87.5±0.83), triglycerides (173.5±0.83), HDL (21.5±0.83), LDL (42.5±0.83) and VLDL (33.5±0.83).

Effects of *A. montana* on Liver Enzymes of male rabbit’s blood

Gamma GT (13.16±0.65) was found elevated; while, SGOT (20.5±0.83), total bilirubin (0.255±0.0083), direct bilirubin (0.0265±0.0073), SGPT (40.5±0.83) and alkaline phosphatase (103.5±0.83) levels were lowered in the test group treated with *A. montana* as compared to respective male control group.

Effects of *A. montana* on Liver Enzymes of female rabbit’s blood

The liver enzymes, SGOT (31.5±0.83), direct bilirubin (0.03±0.0063), SGPT (78.5±0.83), alkaline phosphatase (42.5±0.83) and gamma GT (8.5±0.83) were observed elevated in female test group treated with *A. montana* as compared to female control group.

Urine analysis of male rabbits treated with *A. montana*

The urine of the male group treated with *A. montana* was yellow in colour and turbid like that of its respective male control group. The pH was 9.07, slightly raised as compared to respective control group. Blood was found present in urine of male animal test group. The remaining urine parameters of test group were similar to that of the control.

Urine analysis of female rabbits treated with *A. montana*

The urine of the female group treated with *A. montana* was yellow in colour and turbid, like that of its respective female control group. The pH was 9.07, slightly raised in comparison to its respective control group. The rest of the urine parameters of the test group were found similar to control group.

Effects of Carbon tetrachloride on Liver Enzymes of *A. montana* treated rabbits

In the rabbits treated with *A. montana* extract, the effects of carbon tetrachloride on liver enzymes were observed on carrying out LFT six hours after the administration. The observation
revealed lowered levels of total bilirubin (0.05±0.0063), SGPT (44.08±0.639) and gamma GT (7±0.632). Direct bilirubin (0.07±0.0063) and alkaline phosphatase (42.5±0.836) were found elevated as compared to the control group.

**Autopsy of male rabbit’s organs treated with A. montana**

In heart tissues, focal areas of myocytolysis were observed in right ventricular wall and inter-ventricular septum. Mild portal inflammation and fibrosis was seen in liver tissues. Patchy chronic nonspecific pyelonephritis with no evidence of granuloma or malignancy was seen in kidney tissues. No significant pathology was found in stomach tissues.

**Diuretic activity of A. montana**

The mice given oral dose of 300 mg/kg of A. montana extract exhibited pronounce diuretic activity (2.59±0.0033) at the end of 4 hours as compared to the control (0.93±0.0036). Furosemide 10 mg/kg showed diuretic activity (2.52±0.0033). A. montana exhibited better diuretic activity than Furosemide.

**Anti-urolithiasis activity of A. montana**

A. montana extract in all the tested concentrations revealed anti-urolithic activity. Maximum inhibition of calcium oxalate crystallization was observed 80.2% in 100% concentration of A. montana.

**A. montana use for the treatment of Acne vulgaris**

A. montana may be used for the treatment of acne as German Commission validates anti-inflammatory activity of A. montana, especially for topical application for treatment of acne, bruises, sprains, muscle aches and as a counter-irritant. Clinically efficacy and safety data is available and arnica creams and ointments are commercially available all over Europe.

**References**


Marchishin, S.M. 1983. Efficacy of the phenol compounds of Arnica in toxic lesion of the liver [In Russian]. FarmakolToksikol; 46(2):102106.


