Review of the literature on mistletoe from the first half of 2026

Botany/Distribution

Bolibok L, Kędziora W, Brach M, et al: Spatial determinants of mistletoe dispersal in Scots pine domina–ted forests: are more complex forest stands less prone to invasion? Forest Ecology and Management 2026;603. https://doi.org/10.1016/j.foreco.2025.123435: As pine mistletoe (*Viscum album ssp. austria–cum*) becomes increasingly widespread in European pine forests, with potentially adverse effects on tree health and wood production, this study investigated the spatial and structural factors influencing mistletoe infestation in Scots pine (*Pinus sylvestris*) stands in the Kozienicka Forest in Central Poland. The results showed that older and larger trees were most likely to be infested, and these were associated with increa–sed defoliation, while dense, young, even-aged pine stands showed some resistance. Denser shrub vegeta–tion in the undergrowth and proximity to the forest complex edge significantly increased the likelihood of infestation, suggesting that seed dispersal by birds plays a critical role.

Sancho-Knapik D, Ferrio JP, Gil-Pelegrín E, et al.: *Viscum album* shares hydraulic traits but causes a water uncoupling despite the adjustments of its host *Pinus sylvestris*. Tree Physiology 2026;46:3. https://doi.org/10.1093/treephys/tpag020: In this study – also due to the widespread growth of *Viscum album* and the associated increased sensitivity of *Pinus sylvestris* to drought stress – the hydraulic and gas exchange performance of *Viscum album* was investigated in relation to its host tree, *Pinus sylvestris*, during summer drought. It was found that infected pine branches adjusted their water conductivity to the supplied leaf area, hardly differing from uninfected branches in this respect. However, if the mistletoe infestation exceeded a specific threshold, it caused water disconnection in the infected branches, which was further enhanced during dry conditions.

Sobolewski RK, Szopińska EM, Jaworek-Jakubska J, et al.: Occurrence of common mistletoe (*Viscum album subsp. album*) on alien tree species in the urban green areas of Wrocław (Poland). Urban Ecosystems 2026;29:48. https://doi.org/10.1007/s11252-026-01918-4pp 12: This study investigated the occurrence and degree of infestation by *Viscum album* on non-native tree species considered rare in historic urban green areas of Wroclaw (Poland). The results indicate that *Quercus palustris* (swamp oak), *Celtis occidentalis* (American hackberry, genus of the hemp family), *Carya ovata* (scaly-barked hickory, walnut family), *Juglans nigra* (black walnut), *Aesculus glabra* (Ohio horse chestnut), and *Acer tataricum* (Tatarian steppe maple, Sapindaceae family) were the species most frequently colonised by *Viscum album* under urban conditions in Wroclaw.

Methodology

Guglielmetti G, Doesburg P, Scherr C, et al: Evaluation of copper chloride crystallisation as a method for systems-level characterisation of phytopharmaceuticals – a pilot investigation. Scientific Reports 2026; 16:7506. https://doi.org/10.1038/s41598-026-41081-6: In this pilot study, *Viscum album* extracts, which varied in terms of subspecies (*subsp. album* vs. *subsp. austriacum*), deciduous tree species (apple tree vs. oak) and mixing processes (machine-mixing vs. mixing by hand), were examined using copper chloride crystallisation (CCC) fingerprint analysis. The CCC fingerprints were analysed using seven variables to characterise their texture and structure. All seven variables demonstrated high sensitivity for the extracts from the different mistletoe subspecies. A significant difference was observed between apple tree and oak mistletoe for four variables, whilst two variables showed statistically significant differences with regard to the mixing process.

Biochemistry/Chemistry

Duarte RSP, Melo MNO, Batista JVC, et al (2026) *Viscum album* L. mother tinctures modulate Na^+/K^+ ATPase activity and expression, and promote endothelium-dependent vasodilation via SK channel and nitric oxide signalling. Front. Physiol. 2026;16:1736143. doi: 10.3389/fphys.2025.1736143: The cytotoxic and cardiovascular effects of ten ethanolic extracts of *Viscum album* L., prepared from fresh plants harves–ted in summer and winter, were investigated. The extracts were derived from three subspecies (*Viscum album subsp. album*, *abietis* and *austriacum*) and five different host trees (apple, oak, elm, pine and fir). Cytotoxicity and oxidative stress were investigated *in vitro*, while the effects on Na+/K+-ATPase activity and

expression were evaluated in porcine proximal renal tubular cells. The vascular effects were investigated in perfused mesenteric vascular beds of spontaneously hypertensive rats. It could be shown that *Viscum album* extracts – with the exception of the extract from oak mistletoe – have no cytotoxic effects and do not induce oxidative stress in *in vitro* assays. The *Viscum album* extract obtained from the summer harvest of fir mistletoe reduced the expression and activity of Na+/K+-ATPase in the cell model, whilst all winter extracts only reduced the expression of this enzyme. The winter extract from pine mistletoe triggered vasodilation in the resistance arteries of hypertensive rats, mediated via the nitric oxide/soluble guanylate cyclase/cyclic guanosine monophosphate signalling pathway and the subsequent activation of small conductance calcium-activated potassium channels. The data confirm the efficacy of ethanolic mistletoe extracts as antihypertensives and highlight the importance of the mistletoe species and the season for optimising their antihypertensive potential.

Cardos IA, Danila C, Yahya G, et al.: Targeting Helicobacter pylori enzymes using *Viscum album* L. extract: in silico molecular docking and in vitro study. Front. Cell. Infect. Microbiol. 2026;15: 1690969.doi: 10.3389/fcimb.2025.1690969: In this study, the phenolic compounds in leaf extracts of *Viscum album* and their ability to inhibit key enzymes of *Helicobacter pylori* were investigated using computer-based (*in silico*) tests and *in vitro* assays. The extract exhibited a significant inhi–bitory activity, indicating its potential as a natural urease inhibitor at a concentration of 0.0125 mg/mL, leading to a marked reduction in urease-mediated crystal formation in artificial urine. Furthermore, the extract was effective against various virulence mechanisms: it inhibited biofilm formation in *Staphylococcus aureus* and *Escherichia coli*, as well as protease activity in *S. aureus* and *Pseudomonas aeruginosa*. In summary, the results suggest that the phenolic compounds in *Viscum album* can both inhibit metabolic enzymes and weaken disease-promoting factors, mea–ning that *Viscum album* can be used as a promising source of plant-based therapeutics against multidrug-resistant pathogens with possible applications in the treatment of H. pylori-related gastrointestinal disorders.

Wang J, Chen J, Ju X, et al.: Host-dependent metabolomic variations in *Viscum coloratum* revealed by UHPLC–Q-TOF-MS/MS and integrated annotation strategies. Journal of Separation Science 2026;49:6. https://doi.org/10.1002/jssc.70464: *Viscum coloratum* (Kom.) Nakai exhibits host tree-dependent meta–bolite characteristics which remain inadequately characterised to date and which should therefore be investigated comprehensively in this study. A total of 68 different constituents were identified, belonging mainly to the metabolite groups of phenylpropanoids, polypeptides, lipids and lipid-like compounds, as well as organic acids and their derivatives. Furthermore, significant differences in antioxidant capacity were observed across the different host trees, confirming the influence of the host tree on the pharmacologically relevant properties of *Viscum coloratum*.

Preclinic

Cell cultures

Hong CE, Lyu SY: Mistletoe lectin overcomes macrophage-mediated chemo-resistance in 3D co-culture models of triple-negative breast cancer. Biocell 2026;50(2):11. doi: 10.32 604 /biocel 1. 2025. 07557 4: Tumour-associated macrophages (TAMs) contribute to resistance to cytostatic drugs in triple-negative breast cancer (TNBC), and until now there are only limited options for reprogramming TAMs to simulta–neously increase the efficacy of chemotherapy. This study therefore investigated the potential of Viscum album L. var. coloratum agglutinin (VCA) to improve the sensitivity of TNBC cells to doxorubicin (DOX) and to modulate TAM-mediated resistance to chemotherapy. The results showed that the VCA-DOX combi–nation exhibited synergistic anti-cancer effects through the reprogramming of TAMs and enhanced sensi–tivity to chemotherapeutic agents.

Murine test systems

Hao Z, Liu Y, Wang Y, et al: *Viscum coloratum* (Kom.) Nakai inhibits osteoclastogenesis in RANKL-induced osteoclast differentiation through the PI3K/AKT/mTOR pathway. Cytotechnology 2026;78(2):67. doi: 10.1007/s10616-026-00941-9 (see also Hao et al.: Reviews second half of 2025): A recently published study

has shown that *Viscum coloratum* (Kom.) Nakai can allivate the clinical symptoms of rheumatoid arthritis (RA) and reduce osteoclastogenesis-related gene expression in a mouse model. This study now demons–trated that the extract of *Viscum coloratum* (EVC) has a significant effect against RANKL-induced osteoclast differentiation identified by inhibiting the formation of TRAP-positive multinucleated osteoclasts, TRAP activity, and decreasing osteoclast-specific genes NFATc1 expression. The findings also showed that EVC has its well-known effects of strengthening muscles and bones in the treatment of RA by inhibiting osteo–clastogenesis via the regulated PI3K/AKT/mTOR signalling pathway, and that Viscumneoside III is the main active substance in this process.

Clinic

Clinical studies

Offer K, Reif M, Andersen C, et al: MISTOSUS: a phase II trial of *Viscum album* extract adjuvant therapy for relapsed resectable osteosarcoma. Future Oncology 2026;22(8):901-909. https://doi.org/10.1080/14796694. 2026.2638986: This single-arm Phase II trial, conducted in the United States, investigates the efficacy of the *Viscum album* extract Iscador P – to be administered subcutaneously three times a week for one year – in approximately 32 children, adolescents and young adults with relapsed osteosarcoma, whose lung metastases have been completely resected. The primary endpoint of the study is relapse-free survival at twelve months; secondary endpoints include time to relapse, quality of life, and changes in the immune profiles of tumour tissue and blood samples following treatment with *Viscum album*. The first patient was enrolled in the study in May 2024. The planned duration of the study is approximately 60 months.

Wode K, Björ O, Klein R, et al: Mistletoe extract in patients with advanced pancreatic cancer: Health-related quality of life in a double-blind, randomized, placebo-controlled trial (MISTRAL). Palliative Medicine 2026:1-18. :doi: 10.1177/02692163261437609: In this publication (the MISTRAL study), the health-related quality of life of 290 patients with advanced pancreatic cancer was assessed who received either comprehensive oncological treatment with palliative care and a placebo, or who additionally received mistletoe therapy with Iscador Qu over a period of 9 months. Quality of life worsened with the progression of the disease in both groups; however, no statistically significant differences in quality of life or body weight were found between the two treatment groups. *Editor's note: In contrast to the earlier MAPAC study (Tröger et al. 2014) and further real world data studies, the MISTRAL study showed no significant improvement in quality of life resulting from mistletoe therapy. Possible reasons include the generally better palliative care in Sweden, as well as the frequent use of corticosteroids, which could weaken the immune-activating effect of mistletoe therapy.*

Case reports

Gigineishvili D, Rukhadze T, Orange M: Integrative oncology approach in advanced myxofibrosarcoma: A case report of prolonged survival with high-dose vitamin C and *Viscum album*. Case Rep. Oncol. 2026;19: 467-478. doi: 10.1159/000550177: This case report describes the clinical course of a 59-year-old male with high-grade, unresectable myxofibrosarcoma of the right buttock and spinal metastases. Standard palliative treatments (systemic chemo- and radiotherapy, followed by targeted and immunotherapy) were combined with high-dose intravenous vitamin C and *Viscum album* extracts given intravenously, subcutaneously, and intratumorally. Despite the progression of the disease and COVID-19 comorbidity, the patient survived for 48 months, exceeding conventional survival estimates.

Veterinary medicine

Fonseca LAG da, Ferreira AL de CF, Rodríguez J, Ribeiro IB. Integrative therapy with *Viscum album* in a cat with suspected neoplasia in the proximal ascending colon: case report. Pubvet 2026;20(02):e1902. https://ojs.pubvet.com.br/index.php/revista/article/view/4546: This case report describes a male cat of just about 17 years with a suspected neoplasm in the initial portion of the ascending colon. Due to the risks of anaesthesia and the cat's advanced age, an integrative therapeutic approach was chosen, consisting of the subcutaneous administration of a *Viscum album* extract over a period of one month. After completion of the therapeutic protocol and ultrasonographic reevaluation, the absence of focal thickening of the

intestinal wall and improvement in wall stratification were observed, along with stability of the mesenteric lymph nodes, indicating a positive response to the treatment.

Valle ACV, Valle MLPV: Treatment of a grade II mast cell tumor in a young dog using injectable *Viscum album* therapy. Medical Research Archives 2026;14(4). https://doi.org/ 10.18103/ mra.v14i4.7371: This case report describes a male Teckel, almost two years old, with a grade II mast cell tumour. From March 2023 onwards, he was treated with homeopathic Viscum album injection preparations in potencies D2, D3, D6, D9, D12 and D30, as well as with other integrative therapeutic approaches such as vitamin C, vitamin D3 and curcumin; the dosage and potency of the remedies were adjusted every 60 to 90 days over a period of 20 months. A follow-up biopsy performed in January 2025 revealed the absence of tumour cells at the site of the initial incision, indicating complete tumour regression. Although multiple therapies were used throughout the treatment period, the consistent inclusion of *Viscum album* suggests a potential role for this therapy as part of the integrative approach.

Valle ACV, Valle MLPV, Carvalho AC de. Treatment and survival of a dog diagnosed with multiple myelo–ma using *Viscum album* therapy: case report. Pubvet 2026;20(04):e1932. https://ojs.pubvet.com.br/ index.php/revista/article/view/4664: This case report describes an 11-year-old mixed-breed dog diag–nosed with multiple myeloma affecting a lumbar vertebra, which did not undergo conventional treatment. Instead, *Viscum album* was injected daily in various homeopathic potencies. After six months of follow-up, remodeling of the affected vertebra was observed, with no evidence of disease progression. The patient was monitored longitudinally, demonstrating a six-year survival with good quality of life until death due to age-related natural causes at 17 years of age.