

Biological Activities for Extracts of Boldo (*Peumus boldus*)

Part – Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Leaf Brazil	Toxicity (general)	Hydro-alcohol Ext	Rat	800 mg/kg	Active	Changes in blood levels of bilirubin, cholesterol, glucose, ALT, AST and urea.	L09403
Leaf Brazil	Toxicity (general)	Hydro-alcohol Ext	Rat	800 mg/kg	Inactive	No histological modification.	L09403
Not Stated	Toxicity (general)	Not stated	Not stated	Not stated	Active	Exaggerated reflexes, disturbed coordination and convulsions. In large doses caused paralysis of the motor and sensory nerves and muscle fibers with eventual death due to respiratory arrest.	AV1013
Leaf Brazil	Abortifacient Effect Teratogenic Activity	Hydro-Alcoholic Ext	IG Rat (Pregnant)	800.0 mg/kg	Active		L09403
Leaf Italy	Drug Interaction	ETOH (95%) Ext	Oral Adult Female	Not Stated	Active	A patient was treated with warfarin for atrial fibrillation. During treatment, an increase in International Normalized Ratio (INR) and her admission that she was taking a variety of natural products, to include boldo and fenugreek, led us to suspect that some of these natural products could alter the effect of warfarin. When she stopped the culpable products, the INR returned to normal after 1 week.	E00541
Leaf Italy	Choleretic Activity	ETOH (95%) Ext	IG Rat	Not Stated	Active		L00940
Leaf Germany	Choleretic Activity	ETOH (95%) Ext H2O Ext	Oral Rat Oral Rat	Not Stated Not Stated	Active Inactive		A02959
Leaf Not Stated	Choleretic Activity	Not Stated	IG Dog	Not Stated	Weak Activity		W04226
Leaf Chile	Choleretic Activity	ETOH (70%) Ext	IP Mouse	10.0 mg/kg	Active		M27101
Leaf Chile	Antihepatotoxic Activity	ETOH (70%) Ext	Cell Culture	0.5 mg/ml	Active	Rat liver cells vs. tert-butylhydroperoxide-induced hepatotoxicity. Lactate dehydrogenase and malonaldehyde levels were decreased. Leakage of aspartate aminotransferase was also decreased.	M27101

Part – Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Leaf Chile	Antihepatotoxic Activity	ETOH (70%) Ext	IP Mouse	500.0 mg/kg	Active	Glutamate pyruvate transaminase and alanine aminotransferase levels were increased vs. CCl4-induced hepatotoxicity.	M27101
Leaf Chile	Alanine Aminotransferase Stimulation	ETOH (70%) Ext	IP Mouse	500.0 mg/kg	Active	vs. CCl4-induced hepatotoxicity.	M27101
Leaf Chile	Aspartate Aminotransferase Inhibition	ETOH (70%) Ext	Cell Culture	Not Stated	Active	Rat liver cells.	M27101
Leaf Chile	Glutamate-Pyruvate-Transaminase Stimulation	ETOH (70%) Ext	Mouse IP Mouse	500.0 mg/kg 500.0 mg/kg	Active Active	vs. CCl4-induced hepatotoxicity.	M27101
Leaf Chile	Xanthine Oxidase Inhibition	ETOH (70%) Ext	Cell Culture	500.0 mg/kg	Active	Rat liver cells vs.tert-butyl hydroperoxide-induced hepatotoxicity. Lactate dehydrogenase levels were decreased by 57%.	M27101
Leaf Chile	Effect on Intestinal Transit Time	Not stated	Human Adult	2.5 g	Active	Prolongs the orocecal transit time.	AV1021
Leaf Chile	Anti-inflammatory Activity	ETOH (70%) Ext	IP Rat	100.0 mg/kg	Active	vs. carrageenan-induced pedal edema.	M27101
Leaf Not Stated	Antiyeast Activity	ETOH-H2O (1:1) Ext	Agar Plate	500.0 mg/ml	Inactive	<i>Saccharomyces pastorianus</i> . Dose expressed as dry weight of plant.	T16238
Leaf Not Stated	Antifungal Activity	ETOH-H2O (1:1) Ext	Agar Plate	500.0 mg/ml	Inactive	<i>Penicillium digitatum</i> <i>Trichophyton mentagrophytes</i>	T16238
Leaf Not Stated	Antifungal Activity	ETOH-H2O (1:1) Ext	Agar Plate	500.0 mg/ml	Active	<i>Aspergillus fumigatus</i> <i>Aspergillus niger</i> <i>Botrytis cinerea</i> <i>Rhizopus nigricans</i>	T16238
Leaf Not Stated	Antiviral Activity	H2O Ext	Cell Culture	10.0%	Inactive	<i>Herpes</i> Type 2, <i>Influenza</i> A2 (Manheim 57), <i>Poliovirus</i> II <i>Vaccinia</i>	T09507
Leaf Not Stated	Antiviral Activity	ETOH-H2O (1:1) Ext	Agar Plate	500.0 mg/ml	Inactive	<i>Candida albicans</i>	T16238
Leaf Chile	Antiviral Activity	Decoction Hydro-Alcoholic Ext	Cell Culture	100.0 mcg/ml	Inactive	Viruses— <i>Herpes simplex 1</i> and <i>Herpes simplex 2</i> assayed in vero cells; <i>HIV</i> assayed in JM cells.	K27888

Part – Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Leaf Not Stated	Cytotoxic Activity	H2O Ext	Cell Culture	10.0%	Weak Activity	HeLA cells.	T09507
Leaf + Stem Chile	Antitumor Activity, Cytotoxic Activity	ETOH-H2O (1:1) Ext	IP Mouse Cell Culture	Not Stated ED50 >20.0 mcg/ml	Inactive	Leuk-P388. CA-9KB.	A00678

Biological Activities for Compounds of Boldo (*Peumus boldus*)

Compound	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Boldine	Toxicity (general)	Intradermal	Not stated	Active	Paralyzes motor and sensory nerves and muscle fibers.	ZZ1049
Boldine	Toxicity (general)	Not stated	Not stated	Active	Causes excitement, exaggerates the reflexes and respiratory movement, causes cramps and convulsions. Leads to death from respiratory paralysis.	ZZ1049 ZZ1052
Boldine	Uterine Relaxant Effect	Rat (uterus)	Not stated	Active	Uterine relaxant effect through its ability to block calcium entry.	AV1037
Boldine	Genotoxic Activity	Cell Culture	10 mcg/ml 20 mcg/ml 40 mcg/ml	Inactive	No significant increase in the frequency of chromosome aberrations or sister-chromatid exchanges.	AV1023
Boldine	Genotoxic Activity	Mouse	225 mg/kg 450 mg/kg 900 mg/kg	Inactive	No significant increase in the frequency of chromosome aberrations or sister-chromatid exchanges.	AV1023
Boldine	Genotoxic Activity Mutagenic Activity	Cell Culture Cell Culture	Not stated Not stated	Inactive Weak Activity	No effect. Some crossing over and gene conversion with cytoplasmic 'petite' mutation.	AV1024
Boldine	Choleretic Activity	Not stated	Not stated	Active		AO1223
Boldine	Hepatic microsome CYP3A Inhibition	Cell culture	Not stated	Active	Inhibited CYP1A-dependent 7-ethoxyresorufin O-deethylase and CYP3A-dependent testosterone 6 beta-hydroxylase activities.	AV1014
Boldine	Diuretic Activity	Dog	Not stated	Active	Increased urinary excretion by 50%.	AV1011

Compound	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Boldine	Antioxidant Activity	Oral Rat	100 mg/kg	Active	Decreased the level of malondialdehyde and carbonyls in liver, kidney and pancreas mitochondria and decreased the elevation of MnSOD in the kidney and pancreas mitochondria in streptozotocin-induced diabetic rats.	AV1015
Boldine	Antioxidant Activity	Oral Rat	100 mg/kg	Active	Restored altered glutathione peroxidase enzyme activity in the liver and pancreas of streptozotocin-induced diabetic rats.	AV1015
Boldine	Antioxidant Activity	Oral Rat	100 mg/kg	Active	Attenuated both streptozotocin- and iron plus ascorbate-induced malondialdehyde and carbonyl formation and thiol oxidation in the pancreas.	AV1015
Boldine	Antioxidant Activity	Oral Rat	100 mg/kg	Active	Decomposed superoxide anions, hydrogen peroxides and hydroxyl radicals. Attenuated the production of superoxide anions, hydrogen peroxide and nitric oxide caused by liver mitochondria.	AV1015
Boldine	Antioxidant Activity	Cell Culture	Not stated	Active	Protected intact red blood cells against the hemolytic damage induced by a free radical initiator AAPH.	AV1016
Boldine	Antioxidant Activity	Cell Culture	Not stated	Active	Reduced the production of ROS induced by stannous chloride, and the lethal effect of ROS on <i>E. coli</i> AB1157.	AV1017
Boldine	Antioxidant Activity	Cell Culture (PC12 cells)	10-100 microM	Active	Reduced the effect of catecholamine oxidation in brain mitochondria. Scavenged hydrogen peroxide and hydroxyl radicals, decreased the formation of melanin from dopamine. All of the above resulted in the decrease of dopamine-induced death of PC12 cells.	AV1026
Boldine	Antioxidant Activity	Cell culture (rat hepatocytes)	200 micromol/L 0.91 mol/L	Active Weak Activity	Inhibited peroxidation induced by tert-butyl hydroperoxide (TBOOH). No effect on reduced glutathione levels. Inhibited lipid peroxidation induced by TBOOH.	AV1031
Boldine	Antioxidant Activity	Cell Culture	Not stated	Active	Prevented brain homogenate autooxidation, AAP-induced lipid peroxidation of RBC membranes and AAP-induced inactivation of lysozyme.	AV1036
Boldine	Gluthathione S-transferase Stimulation	Cell Culture	Not stated	Active		AV1014

Compound	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Boldine	Cytoprotective Effect	Cell Culture	Not stated	Active	Protected red blood cells against chemically induced hemolytic damage.	AV1016
Boldine	Cytoprotective Activity	Cell culture (rat hepatocytes)	200 micromol/L 0.91 mol/L	Active Inactive	Prevented lytic damage induced by tert-butyl hydroperoxide (TBOOH).	AV1031
Boldine	Neuromuscular Blocking Activity	In vitro (mouse diaphragm)	<200 microM	Active Inactive	After an initial period of twitch augmentation, inhibited the nerve-evoked twitches of the mouse diaphragm. Muscle-evoked twitches unaffected.	AV1019
Boldine	Neuromuscular Blocking Activity	In vitro (mouse diaphragm)	IC50=13.5 mcM 50 microM	Active Active	Inhibited the acetylcholine-induced contraction of denervated diaphragm. Inhibited the amplitude of the miniature end plate potential.	AV1019
Boldine	Neuromuscular Effect	In vitro (mouse diaphragm)	200 microM	Active	Increase in resting tension seen.	AV1019
Boldine	Neuromuscular Effect	In vitro (mouse diaphragm)	10-200 mcM 300 mcM	Inactive Active	Muscle-evoked twitches. Induced muscle contracture.	AV1020
Boldine	Neuromuscular Effect	Skeletal muscle of Rat or Rabbit	Not stated	Active	Induced calcium release from storage in skeletal muscle.	AV1020
Boldine	Vascular Smooth Muscle Effect	Guinea pig (trachea)	0.1-100 microM	Inactive	Contractions induced by acetylcholine or histamine.	AV1030
Reticuline	Antispasmodic Activity	Uterine muscle	Not stated	Active	Antagonize uterine muscular contractions induced by acetylcholine and calcium.	AV1038
Cocclaurine	Antispasmodic Activity	Uterine muscle	Not stated	Active	Antagonize uterine muscular contractions induced by acetylcholine and calcium.	AV1038
Boldine	Immunosuppressive Activity	Oral Human	Not stated	Active	Decreased blastogenesis in normal subjects and patients with chronic lymphocytic leukemia.	AV1034
Boldine	Immunostimulant Activity	Oral Human	Not stated	Active Inactive	In patient with chronic lymphocytic leukemia natural killer cell activity was enhanced. No effect on natural killer cell activity in tumor-bearing patients.	AV1034
Boldine	Anti-inflammatory Activity	Guinea Pig	ED50=34 mg/kg 75 microM	Active Active	Carrageenan-induced paw edema. 53% inhibition of prostaglandin synthesis.	AV1022

Compound	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Boldine	Anti-inflammatory Activity	Oral Mice Rats	Not stated	Active Active Inactive Active	Protected against colonic damage (expressed by reductions in cell death, tissue disorganization and edema) in acetic acid induced colitis. Reduced colonic neutrophil infiltration. Tissue lipoperoxides. Preserved colonic fluid transport.	AV1028
Terpinen-4-ol	Anti-inflammatory Activity	Cell Culture	Not stated	Active	Suppressed the production of TNFalpha, IL-1beta, IL-8, IL-10 and PGE2 by LPS-activated monocytes.	AV1045
Terpinen-4-ol	Antiulcer Activity	Not stated	Not stated	Active Active	HCl/ethanol, HCl/aspirin, water-immersion stress and pylorus-ligation induced ulceration. Secretion of gastric juice and output of acid and pepsin activity lowered.	AV1046
Boldine	Antiallergic Activity	Cell Culture	Not stated	Active	Relieved allergic symptoms by inhibiting histamine-release from mast cells.	AV1047
Boldine	Antipyretic Activity	Oral Rabbits	60 mg/kg	Active	Reduced bacterial pyrogen-induced hyperthermia between 50%-98%.	AV1022
Boldine	Antidiabetic Activity	Oral Rat	100 mg/kg	Active	Attenuated the development of hyperglycemia and weight loss induced by streptozotocin.	AV1015
Boldine	Cardiovascular Effect	Guinea pig (heart)	10(-5) - 2 x 10 (-4) M	Active	Increased coronary flow, depressed cardiac force and heart rate.	AV1025
Boldine	Cardiovascular Effect	Guinea pig (aorta)	IC50=1.4 microM 300 microM 1-300 microM 30 microM	Active Weak Activity Inactive Active	Inhibited contractile response evoked by noradrenaline Calcium-induced contractions. Contraction induced by caffeine. Inhibited inositol phosphate formation induced by noradrenaline.	AV1030
Boldine	Vasorelaxant Activity	Rat (kidney)	Not stated	Active	Inhibited potassium-evoked vasoconstriction at doses 70-fold higher than diltiazem.	AV1025
Boldine	Vasorelaxant Activity	Rat (thoracic aorta)	Not stated	Active		AV1032
Boldine	Alpha 1-adrenoceptor Blocking Agent	Guinea pig (aorta)	Not stated	Active	Competitive antagonism to noradrenaline-induced vasoconstriction.	AV1030

Compound	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Boldine	Platelet Aggregation Inhibition	Cell culture (rabbit platelets)	Not stated	Active Active	Inhibited platelet aggregation. Inhibited the release of ATP induced by arachidonic acid and collagen in rabbit platelets.	AV1029
Boldine	Platelet Aggregation Inhibition	Cell Culture	Not stated	Active	Inhibited arachidonic acid induced platelet aggregation.	AV1032
Boldine	Calcium Channel Antagonist Activity	Not stated	Not stated	Active		AV1025
Boldine	Dopamine Antagonist Activity	Mice	IP 40 mg/kg	Inactive	In spite of its affinity for D1- and D2-like receptors it does not display central dopaminergic antagonist activities.	AV1027
1,8-cineole	Anticancer Activity	Cell Culture	Not stated	Active Inactive	Apoptosis of human leukemia Molt 4B and HL-60 cells. Human stomach cancer KATO III cells.	AV1042
Farnesol	Anticancer Activity	Cell Culture Hamster	Not stated 1% (w/w) diet	Active Active	After 48 hrs of treatment human BxPC3 pancreatic cancer cells had a 3-10 fold increase in apoptosis and higher BAK expression than controls. Decreased incidence of pancreatic carcinoma.	AV1043
Boldine	Antitumor promoting Activity	Cell Culture (rat liver epithelial cells)	50 microM	Active	100% inhibition of the effect of TPA, in part due to its ability to reduce the increased accumulation of intracellular oxidants.	AV1033
Linalool 1,8-cineole	Antimicrobial Activity	Agar Plate	Not stated	Active	<i>Candida albicans</i> <i>E. coli</i> <i>Listeria monocytogenes</i> <i>Proteus mirabilis</i> <i>Salmonella spp.</i> <i>Staphylococcus aureus</i>	AV1039
Terpinen-4-ol 1,8-cineole	Antimicrobial Activity	Agar Plate	Not stated	Active		AV1041
Ascaridole	Anthelmintic Activity	Not stated	Not stated	Active		AV1012
Boldine	Antitrypanosomal Activity	Broth Culture	IC50=110 microM	Active	<i>Trypanosoma cruzi</i> , LQ strains and DM 28c clone.	AV1035
1,8-cineole	Antifungal Activity	Agar Plate	Not stated	Weak Activity	13 fungi species.	AV1040

Compound	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Essential Oil	Antibacterial Activity	Agar Plate	15.0 mcl 25.0 mcl 25.0 mcl	Active Active Active	<i>Escherichia coli</i> <i>Pseudomonas aeruginosa</i> <i>Staphylococcus aureus</i>	T14973
Essential Oil	Antiyeast Activity	Agar Plate	5.0 mcl	Active	<i>Candida albicans</i>	T14973
Farnesol	Antibacterial Activity	Agar Plate	MIC=100 microg/ml	Active	<i>S. aureus</i>	AV1044

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