

## Biological Activities for Extracts of Guaraná (*Paullinia cupana*)

Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Seed Brazil	Toxic Effect (general)	Not Stated	Oral Dog	Not Stated	Active	Accidental ingestion of herbal supplements containing primarily guarana and ma huang in dogs can lead to a potentially lethal condition that may require prompt detoxification and supportive treatment for several days. Effects described are from a multi-component rx.	L10981
Seed Brazil	Toxic Effect (general)	Not Stated	Oral Human Adult Female	Not Stated	Equivocal	A single case report of a female patient with severe heart palpitations after taking two combination herbal supplements for 3-4 months. She was also taking multiple prescription medications. After discontinuation of the herbal supplements the palpitations stopped, no direct correlation of guarana was presented. Effects described are from a multi-component rx.	E01236
Seed Brazil	Toxic Effect(general)	Infusion	IG Rat	0.3 mg/ml	Inactive	No difference was reported upon evaluation of life-span of experimental and control groups treated for 23 months.	J11778
Seed Brazil	Toxic Effect(general)	Infusion	IG Rat	3.0 mg/ml	Inactive		J11778
Seed Brazil	Toxic Effect(general)	Lyophilized Extract	IP Rat Oral Rat	1000-2000 mg/kg 1000-2000 mg/kg	Inactive Inactive		L04285
Seed Brazil	Toxic Effect(general)	Lyophilized Extract	Rat	Not Stated	Inactive	Histopathological exam revealed no alteration in heart, lungs, stomach, small and large intestine, liver, pancreas, kidneys, bladder and spleen.	L04285
Not Stated Australia	Toxic Effect(general)	Health Drink	Oral Human Adult	Not Stated	Active	One female with pre-existing mitrial valve prolapse developed intractable ventricular fibrillation.	BK1023

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Not Stated USA	Toxic Effect(general)	Not Stated	Oral Human Adult	240 mg (of caffeine from guarana)	Active	Adverse symptoms reported included dry mouth, insomnia and headache.	BK1024
Seed Brazil	Genotoxicity Activity	Lyophilized Extract	Agar Plate	LC50=0.0 mg	Active	<i>Escherichia coli</i> wp2s(lambda) lysogenesis induction assayed. Catalase, superoxide dismutase, thiourea, or s9 fraction inhibited effect.	K16178
Seed Brazil	Genotoxicity Activity	Lyophilized Extract	Agar Plate	LC50=0.0 mg	Active	<i>Escherichia coli</i> wp2s(lambda) lysogenesis induction assayed. Catalase, superoxide dismutase, thiourea, or s9 fraction inhibited effect.	K16178
Seed Brazil	Mutagenic Activity	Lyophilized Extract	Agar Plate	30.0 mg 30.0 mg LC50=0.0 mg	Inactive Inactive Inactive	<i>Salmonella typhimurium</i> ta100. <i>Salmonella typhimurium</i> ta102. <i>Salmonella typhimurium</i> ta98.	K16178
Not Stated Brazil	Radiouptake Inhibition	Not Stated	Cell Culture	Not Stated	Active	Inhibited the uptake of radioactivity by RBC and altered the shape of the RBC.	BK1019
Seed Brazil	Platelet Aggregation Inhibition	H2O Ext	Cell Culture Rabbit platelets	100.0 mg/ml	Active	Decreased platelet aggregation by 37%.	K16359
Seed Brazil	Platelet Aggregation Inhibition	H2O Ext H2O Ext	Cell Culture Cell Culture	50.0 micromols 50.0 micromols	Active Active	vs. arachidonic acid-induced aggregation. vs. ADP-induced aggregation.	M22988
Seed Brazil	Platelet Aggregation Inhibition	H2O Ext	Cell Culture	50 mu.l 100 mu.l	Active Strong Activity	Decreased aggregation seen. No aggregation seen.	BK1033
Seed Brazil	Platelet Aggregation Inhibition	H2O Ext	IG Rabbit	20.0 ml 20.0 ml	Active Active	vs. ADP-induced aggregation. vs. arachidonic acid-induced aggregation.	M22988
Seed Brazil	Platelet Aggregation Inhibition	H2O Ext	IG Rabbit	20 ml	Active Active	vs. arachidonic acid-induced aggregation. vs. ADP-induced aggregation.	BK1033
Seed Brazil	Platelet Aggregation Inhibition	H2O Ext	IV Rabbit	1.0 ml 1.0 ml	Active Active	vs. ADP-induced aggregation. vs. arachidonic acid-induced aggregation.	M22988
Seed Brazil	Platelet Aggregation Inhibition	H2O Ext	IV Rabbit	1 ml	Active Active	vs. arachidonic acid-induced aggregation. vs. ADP-induced aggregation.	BK1033

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Not Stated Denmark	Fibrinogen Reduction	Not Stated	Human Adult	2000 mg	Active	In an 8 week and 3 month trial a drop in plasma fibrinogen was seen.	BK1004
Seed Brazil	Thromboxane B-2 Synthesis Inhibition	H2O Ext	Cell Culture Rabbit platelets	100.0 mg/ml	Active	Decreased platelet thromboxane formation from arachidonic acid by 78%.	K16359
Seed Brazil	Thromboxane B-2 Synthesis Inhibition	H2O Ext	Cell Culture Rabbit platelets	Not Stated	Active		BK1033
Seed England	Pharmacokinetic Study	Powder	Rat	Not Stated	Intestine	Release and absorption of caffeine from extract not different from those of pure compound.	K11103
Seed Brazil	Antifatigue Activity	Infusion	IG Mouse	0.3 mg/ml 3.0 mg/ml	Active Inactive	vs. forced swimming test. vs. forced swimming test.	J11778
Not Stated Denmark	Energy Enhancement	Not Stated	Human Adult	2000 mg	Active	Subjective report of more energy and less tiredness.	BK1004
Not Stated	Energy Enhancement	Not Stated	Human Adult	Not Stated	Active	US Patent on a combination of plants including guarana to provide sustained energy and mental alertness without nervousness or tension.	BK1031
Not Stated	Weight Loss	Chewing gum	Human Adult	0.05 mg - 5 g	Active	Creates energy and gives a feeling of fullness.	BK1017
Seed Not Stated	Weight Loss	Not Stated	Oral Human Adult	Not Stated	Inactive	Dosing 3 times a day for 10 days. The effect was found in a mixture of <i>Cola acuminata</i> , <i>Paullinia cupana</i> , <i>Turnera diffusa</i> , <i>Agathosma species</i> and <i>Ilex paraguariensis</i> .	T15449
Not Stated USA	Weight Loss	Not Stated	Oral Human Adult	240 mg (of caffeine from guarana)	Active	35 subjects received Ma Huang-Guarana combination; weight and fat loss seen after 8 weeks.	BK1024
Not Stated Denmark	Weight Loss	Not Stated	Human Adult	2000 mg	Active	In an 8 week and 3 month trial weight loss was seen.	BK1004
Seed Brazil	Thermogenic Activity	Seeds	Oral Human Adult	2.72 gm	Inactive	No significant increase in energy expenditure. No change in respiratory quotient.	L05756

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Seed Denmark	Thermogenic Activity	Not Stated	Oral Human Adult	Not Stated	Active	In combination with Yerba mate and Damiana it prolonged gastric emptying time, reduced body weight and maintained weight over 12 months.	BK1021
Not Stated Brazil	Neurological Effect	Not Stated	Human Adult	Not Stated	Inactive	No significant cognitive alterations.	BK1025
Not Stated Brazil	Neurological Effect	Not Stated	Human Adult	Not Stated	Inactive	No effect on cognition, anxiety and sleep in 30 subjects.	BK1026
Entire Plant Not Stated	CNS Stimulant Activity	Hot H2O Ext	Oral Human Adult	Not Stated	Active	A chewing gum for preventing drowsiness.	T10251
Not Stated	CNS Activity	Not Stated	Human Adult	Not Stated	Active	Resulted in faster reaction times and improved speed-hand-eye coordination. Accuracy reduced.	BK1004
Seed Brazil	Sleep Time Increased	Lyophilized Ext	IG Rat Male	2000. mg/kg	Inactive	vs. barbiturate-induced narcosis.	L04285
Seed Brazil	Memory Retention Improvement	Infusion	IG Rat	0.3 mg/ml	Equivocal	vs. active avoidance test. Evaluation after 75 and 120 days of treatment.	J11778
Seed Brazil	Memory Retention Improvement	Infusion	IG Rat	3.0 mg/ml	Equivocal	vs. active avoidance test. Evaluation after 75 and 120 days of treatment.	J11778
Seed Brazil	Antiamnesic Activity	Infusion	IP Mouse IP Mouse IP Rat IP Rat	3.0 mg/ml 30.0 mg/ml 0.3 mg/ml 3.0 mg/ml	Active Active Active Inactive	vs. scopolamine induced amnesia in animals subjected to passive avoidance task test.	J11778
Not Stated Brazil	Muscle Relaxant Effect	Not Stated	Rabbit Corpus cavernosum	1 mg/ml	Active	Short-lived relaxation of the corpus cavernosum seen.	BK1020
Not Stated Brazil	cAMP Synthesis	Not Stated	Rabbit Corpus cavernosum	1 mg/ml 10 mg/ml 100 mg/ml	Strong Activity Active Active	Increased the cAMP levels by 200%. 150% increase in nucleotide levels. 89% increase in nucleotide levels.	BK1020
Seed Brazil	Analgesic Activity	Hydro-alcoholic Ext	IG Mouse	200.0 mg/kg 200.0 mg/kg 200.0 mg/kg  200.0 mg/kg 200.0 mg/kg	Active Active Active  Active Active	vs. acetic acid-induced writhing. vs. hot plate method. vs. tail flick response to radiant heat. vs. formalin-induced algesia. vs. capsaicin-induced algesia.	J13503

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Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Not Stated	Headache Relief	Not Stated	Human Adult	125 mg	Active	US Patent on a combination of plants including guarana to relieve pain and other symptoms associated with migraines and headaches.	BK1032
Seed Brazil	Hyperglycemic Activity	H2O Ext	Mouse	500 mg/kg	Active	Increased blood glucose level and decreased liver glycogen content 60 minutes after maltose administration.	J18356
Seed Brazil	Antihyperglycemic Activity	H2O Ext	Mouse Male	500.0 mg/kg	Inactive	vs. epinephrine-induced hyperglycemia.	J18356
Seed Brazil	Antihypoglycemic Activity	H2O Ext	Mouse	500 mg/kg	Active	Suppressed exercise-induced hypoglycemia.	J18356
Not Stated Denmark	Hypocholesterolemic Activity	Not Stated	Human Adult	2000 mg	Active	After 3 months of supplementation a rise in HDL was seen.	BK1004
Seed Brazil	Antioxidant Activity	Lyophilized Extract	Not Stated	1.2 mcg/ml	Active	Effect measured by thiobarbituric acid reactive substances. Inhibited lipid peroxidation.	L04285
Not Stated	Cytotoxic Activity	H2O Ext	Cell Culture	250.0 mcg/ml	Active	Ca-jtc-26.	J19374
Not Stated China	Cytotoxic Activity	Hot H2O Ext	Cell Culture	500.0 mcg/ml	Inactive	Cells-he-1 the inhibition rate was 11%.	M27219
Not Stated China	Cytotoxic Activity	Hot H2O Ext	Cell Culture	250.0 mcg/ml	Active	Ca-jtc-26 the inhibition rate was 82%.	M27219
Seed Brazil	Cytotoxic Activity	Infusion	Cell Culture	32.02 mg/ml 34.62 mg/ml 39.95 mg/ml	Inactive Inactive Inactive	Not Stated. vs. MTT-formazan assay. vs. kenacid blue assay.	J19973
Seed Brazil	Cytotoxic Activity	H2O Ext	Cell Culture	120.0 mcg/ml 120.0 mcg/ml 500.0 mcg/ml 500.0 mcg/ml	Equivocal Equivocal Inactive Inactive	Ca-mammary-microalveolar. Cells-human-embryonic he-1. Ca-mammary-microalveolar. Cells-human-embryonic he-1.	M26592
Seed Brazil	Cell Proliferation Inhibition	H2O Ext	Human Adult Lymphocytes	100.0 mcg/ml	Active	vs. phytohemagglutinin-induced proliferation. Effect reversible.	K19547
Kernel Brazil	Anticaries Activity	H2O Ext	Broth Culture	1.5%	Inactive	<i>Streptococcus mutans</i> stimulated plaque fermentation and had no influence on the synthesis of insoluble polysaccharides.	M25425

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Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Seed Brazil	Effect on Teeth	Seeds	Not Stated	Not stated	Active	A carbonated beverage, "guarana" was tested against human teeth.	K27240
Leaf Not Stated	Tyrosinase Stimulation	Not Stated	External Human Adult	10.0%	Active	Used to prevent gray hair and sunburn.	J13191
Seed Brazil	Hyaluronidase Inhibition	Hot H2O Ext	Not Stated	0.002 %	Active	75% inhibition.	A00401
Seed Not Stated	Reductase, 5-alpha Inhibition	ETOH(95%)Ext	Not Stated	1.0%	Active		K22288

## Biological Activities for Compounds of Guarana (*Paullinia cupana*)

Compound Tested	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Caffeine	Toxicity(general)	Not Stated	Not Stated	Active	May induce nervousness, insomnia and tremors; stimulates the respiratory center.	ZZ1048
Theophylline	Toxicity(general)	Not Stated	Not Stated	Active	May cause nervousness, sleeplessness, tachycardia, nausea, vomiting, headaches, tremors, epigastralgia, diarrhea, agitation and insomnia.	ZZ1048
Caffeine	Toxicity (in utero)	Oral Rat	0.02% Drinking water	Active	In utero exposure affects central respiratory control - higher respiratory frequency and hypoxic respiratory depression seen.	BK1034
Caffeine	Convulsant Activity	Human Adult	Not Stated	Active	Can exacerbate seizures in those with epilepsy.	BK1022
Xanthines	Platelet Aggregation Inhibition	Cell Culture Rabbit platelets	100.0 mg/ml	Active	Decreased platelet aggregation by 31%.	K16359
Chromatographic fraction without salicylic acid, xanthines and nicotinic acid	Platelet Aggregation Inhibition	<i>In vitro</i>	Not Stated	Strong Activity	Decrease in platelet aggregation seen as well as a deaggregation of platelet aggregates. vs. ADP-induced platelet aggregation.	BK1033

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Compound Tested	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Chromatographic fraction containing xanthines and nicotinic acid	Platelet Aggregation Inhibition	<i>In vitro</i>	Not Stated	Active	Decrease in platelet aggregation seen. vs. ADP-induced platelet aggregation.	BK1033
Xanthines	Thromboxane B-2 Synthesis Inhibition	Cell Culture Rabbit platelets	100.0 mg/ml	Active	Decreased platelet thromboxane formation from arachidonic acid by 50%.	K16359
Caffeine	Cardiovascular Activity	Human Adult	250 mg	Active	Increased aortic stiffness, wave reflections and both aortic and radial systolic, diastolic and pulse pressure.	BK1027
Caffeine	Cardiovascular Activity	Not Stated	Not Stated	Active	Positive inotropic action, causes tachycardia, an increase in cardiac output and slight peripheral vasodilation.	ZZ1048
Caffeine	Cardiovascular Activity	Oral Human Adult (hypertensive)	250 mg	Active	Systolic blood pressure and pulse pressure increased; no change in diastolic blood pressure; an increase in aortic stiffness seen.	BK1045
Caffeine	Cardiovascular Activity	Oral Human Adult	870 mg	Active	Increased fasting homocysteine by 0.4 micromol/L or 5%. Effect was stronger in women.	BK1046
Theophylline	Cardiovascular Activity	Not Stated	Not Stated	Active	Used for myocardial stimulation.	BK1035
Theophylline	Diuretic Activity	Not Stated	Not Stated	Active	Increases glomerular filtration.	ZZ1048
Theobromine	Diuretic Activity	Not Stated	Not Stated	Active		BK1036
Caffeine	Diuretic Activity	Not Stated	Not Stated	Active		BK1036
Theophylline	Diuretic Activity	Not Stated	Not Stated	Active		BK1036
Caffeine	Weight Loss	Human Adult	Not Stated	Active	Increases metabolic rate.	BK1030
Caffeine	Weight Loss	Human Adult	Not Stated	Active	Inhibits adenosine, thereby overcoming feedback inhibition of catecholamine release, promoting fat loss.	BK1029

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Compound Tested	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Caffeine	Athletic Performance Activity	Oral Human Adult	250 mg	Inactive Active Active	Short-term performance. Blood lactate increased. Plasma insulin concentrations at rest, end of mock test and during recovery were increased.	BK1037
Caffeine	CNS Activity	Not Stated	Not Stated	Active	Enhances alertness, facilitates thought formation and decreases the sensation of fatigue.	ZZ1048
Theophylline	CNS Activity	Not Stated	Not Stated	Active	Enhances alertness, facilitates thought formation and decreases the sensation of fatigue.	ZZ1048
Caffeine	CNS Activity	Not Stated	Not Stated	Active	Stimulates the central nervous system; increases the activity of the heart.	BK1036
Caffeine	Cognitive Performance	Oral Human Adult	200 mg 300 mg	Active Active	Subjects received caffeine after 72 hrs of sleep deprivation and continuous exposure to stressors. Caffeine improved visual vigilance, choice reaction time, repeated acquisition, self-reported fatigue and sleepiness. Improved results on tests of vigilance, reaction time and alertness.	BK1038
Caffeine	Cognitive Performance	Oral Human Adult	1 or 2 mg/kg followed 60 minutes later with 1 mg/kg	Active  Inactive	Improved performance on a sustained attention task and increased mental alertness in caffeine-deprived consumers. No effect on rated mental alertness and performance on an attention task in consumers who were not caffeine deprived.	BK1039
Caffeine	Cognitive Performance	IP Rat	0.3-10 mg/kg  30 mg/kg 0.3-30 mg/kg	Active  Inactive Active	Post-training dose improved memory retention. Post-training memory retention. Pre-test dose increased memory retrieval.	BK1040
Caffeine	Cognitive Performance	Oral Human Adult	200 mg	Active	Increased alertness and anxiety and improved performance on simple and choice reactive tasks, a cognitive vigilance task, a task requiring sustained response and a dual task involving tracking and target detection.	BK1041

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Compound Tested	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Caffeine	Headache Relief	Human Adult	Not Stated	Active	Helps to relieve migraines and headaches.	BK1032
Caffeine	Anti-inflammatory Activity	Cell Culture	5 x 10 <sup>(-6)</sup> - 1.5 x 10 <sup>(-4)</sup> mol/l	Inactive	No significant effect on endotoxin-induced PGE(2) formation nor on its inhibition by indometacin.	BK1043
Theobromine	Antispasmodic Activity	Not Stated	Not Stated	Active	Smooth muscle.	BK1036
Theophylline	Antispasmodic Activity	Not Stated	Not Stated	Active	Smooth muscle.	BK1036
Theophylline	Antispasmodic Activity	Not Stated	Not Stated	Active	Relaxed the smooth muscles of the bronchi and blood vessels.	BK1035
Theophylline	Bronchial Smooth Muscle Relaxant	Not Stated	Not Stated	Active		ZZ1048
Theophylline	Bronchodilator Activity	Not Stated	Not Stated	Active	Used for conditions such as obstructive airway disease and bronchial asthma.	BK1035
Theophylline	Respiratory Activity	Not Stated	Not Stated	Active	Modest effect on FEV1 and FVC and slightly improved arterial blood gas tensions in COPD.	BK1042
(+)-Catechin	Anti-metastatic Activity	Rat	25 microM	Active	Anti-metastatic in invasive rat prostate adenocarcinoma.	BK1028
Caffeine	Cytotoxic Activity	Topical Mice	Not Stated	Active	Inhibited carcinogenesis and stimulated apoptosis of skin tumors. Decreased size of parametrial fat pads and the thickness of the dermal fat layer.	BK1044
Caffeine	Osteoporotic Activity	Oral Human Adult Female	200-300 mg (2.5-6 fl oz cups)	Active	Associated with a loss of bone mineral density in most skeletal sites. Attenuated with a higher calcium intake (750 mg/day).	BK1047

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