

Bioactive extract	Class	Plant	Origin	Studied part	Extraction	Encapsulation method	Encapsulation Material	Reference
Anthocyanin extracts	-	<i>Bactris guineensis</i> L.	Colombia	Fruits	Methanol/acetic acid (19:1, v/v)	Spray drying	Maltodextrin	69
	-	<i>Daucus carota</i> L.	Turkey	Roots	Ethanol	Spray drying	Maltodextrin and glucodry	67
	-	<i>Euterpe oleracea</i> Mart.	Brazil	Fruit pulp	Juice	Spray drying	Maltodextrin, gum arabic and tapioca starch.	71
	-	<i>Garcinia indica</i> Choisy	India	Fruit pulp	Acidified water	Spray drying	Maltodextrin	68
	-	<i>Myrciaria cauliflora</i> (Mart.)	Brazil	Fruit peels	Acidified ethanol	Rapid extraction of supercritical solution	Polyethyleneglycol and ethanol	94
	-	<i>Myrciaria cauliflora</i> (Mart.)	Brazil	Fruit peels	Acidified ethanol	Internal gelation	Ca-alginate	94
	-	<i>Myrciaria jaboticaba</i> (Mart.)	Brazil	Fruit peels	Acified ethanol	Spray-drying	Maltodextrin, arabic gum and Capsul™	82
	-	<i>Vaccinium</i> genus	Germany	Fruits	n.a	Spray drying	Maltodextrin, citric acid, pectins and caffeine	70
	-	<i>Vaccinium myrtillus</i> L.	Commercial	Fruits	n.a	Emulsion	Whey proteins	118
-	<i>Vaccinium myrtillus</i> L.	Commercial	Fruits	n.a	Emulsion	Pectin and PGPR	110	
Carotenoids	Curcumin	-	Commercial		n.a	Emulsion	Surfactants (SDS STAB, Tween 20 and poloxamer) and solvents (cotton seed oil)	114
	Curcumin	-	Commercial		n.a	Liposomes	Lecithin	127
	Curcumin	-	Commercial		n.a	Complex coacervation	κ-Carrageenan and lysozyme	159
	Lutein	-	Commercial		n.a	Complex coacervation	Gelatin/gum arabic	104
	β-carotene	-	Commercial		n.a	Freeze-drying	<i>Araucaria angustifolia</i> seeds starch	100
	β-carotene	-	Commercial		n.a	Freeze-drying	Normal and modified <i>Araucaria angustifolia</i> seeds starch and gelatin	101
	β-carotene	<i>Capsicum annuum</i> L.	Mexico	Fruits	Oils (corn, sunflower, safflower)	Spray drying	Gum arabic and maltodextrin	53
	β-carotene	-	Commercial		n.a	Spray-drying	Gum arabic	54
Carotenoids and vitamins	Curcumin and retinol	-	Commercial		n.a	Emulsion and biopolymers particules	Casein protein	109
Crude and fatty acid extracts	-	Fish oil	Russia	Oil	Hydrolysis	Emulsification diffusion and precipitation	Benzyl alcohol and Poloxamer 188	111
	-	<i>Pinus sibirica</i> Du Tour	Russia	Seeds	n.a	Emulsification diffusion and precipitation	Benzyl alcohol and Poloxamer 188	111

	-	<i>Thymallus baikalensis</i> Dybowski	Russia	Muscle	Ethanol	Emulsification diffusion and precipitation	Benzyl alcohol and Poloxamer 188	111
Crude extracts	-	<i>Bidens pilosa</i> L.	Brazil	Aerial parts	Ethanol	Spray-drying	Cellulose and Aerosil®	48
	-	<i>Camellia sinensis</i> L.	China	leaves	Ethanol	Emulsion	β -Cyclodextrin	121
	-	<i>Camellia sinensis</i> L.	Spain	Leaves	Acetone	Supercritical antisolvent process	Poly(ϵ -caprolactone)	130
	-	<i>Eugenia uniflora</i> L.	Brazil	Fruits	Juice	Lyophilization	Xanthan, tara and xanthan-tara gums	141
	-	<i>Fadogia ancylantha</i> Schweinf.	Italy	Aerial parts	Ethanol/water (70:30, v/v)	Spray drying	Maltodextrin and pectin	44
	-	Five herbs: <i>Paeonia suffruticosa</i> Andrews, <i>Phellodendron chinense</i> Schneid, <i>Lonicera japonica</i> Thunb, <i>Mentha Spicata</i> L. and <i>Atractylodes lancea</i> Thunb.	China	Tea	Water	Emulsion/Cross-linking	Alginate-chitosan	106
	-	<i>Garcinia cowa</i> Roxb	India	Fruits	Water	Spray drying	Whey protein (also denatured)	43
	-	<i>Hibiscus sabdariffa</i> L.	Commercial		Water	Spray-drying	Milled citrus fibre	47
	-	<i>Hibiscus sabdariffa</i> L.	Commercial		Water	Spray-drying	Milled sugar cane fibre	50
	-	<i>Ilex paraguariensis</i> A. St. Hil.	Argentina	Aerial parts	Water	Co-crystallization	Sucrose	136
	-	<i>Ipomoea batatas</i> L. Lam variety, Sinjami	Korea	Tuber	n.a	Spray drying	Maltodextrin and ascorbic acid	42
	-	<i>Lippia sidoides</i> Cham.	Brazil	Leaves	Ethanol/water (50:50, v/v)	Spray drying	Maltodextrin and gum arabic	45
	-	<i>Melissa officinalis</i> L.	Italy	Aerial parts	Ethanol/water (70:30, v/v)	Spray drying	Maltodextrin and pectin	44
	-	<i>Morinda citrifolia</i> L.	Malasya	Fruits	Ethyl acetate	Spray-drying	k-Carrageenan and maltodextrin	46
	-	<i>Paeonia rokii</i> (S.G.Haw & Lauener)	Italy	Roots	Polar	Spray-drying	Chitosan	52
	-	<i>Piper sarmentosum</i> Roxb.	Commercial		Water	Absorption	Ca-alginate	154
	-	Propolis	Greece		Ethanol	Sonification	β -cyclodextrin	133
	-	<i>Quercus resinosa</i> Liebm.	Mexico	Leaves	Water	Spray-drying	Lactose and sodium caseinate	51
	-	<i>Solanum quitoense</i> L.	Spain	Pulp	n.a	Spray-drying	Arabic gum and maltodextrin	49
	-	<i>Tussilago farfara</i> L.	Italy	Commercial	n.a	Spray drying	Maltodextrin and pectin	44
Enzymes	Cellulases and	-	Commercial		n.a	Spray drying	Alginate	55

	xylanases							
	Coenzyme Q10	-	Commercial		n.a	spray drying.	Gum arabic, maltodextrin and modified starch	56
Essential oil	Cardamom oleoresin	-	Commercial		n.a	Co-crystallization	Sucrose	137
	Engenol and eugenyl acetate	<i>Syzygium aromaticum</i> L.	Brazil	Buds	Ethanol	Spray-drying	Lipid formulation	61
Essential oil extracts	-	<i>Citrus hydrix</i> D.C.	Thailand	Fruit skin	Water	Spray-drying	Konjac glucomannan and gum arabic	58
	-	<i>Cymbopogon nardus</i> G.	Commercial	Aerial parts	n.a	Spray-drying	Skimmed milk powder and whey protein	57
	-	<i>Majorana hortensis</i> L.	Commercial	Aerial parts	n.a	Spray-drying	Skimmed milk powder and whey protein	57
	-	<i>Origanum vulgare</i> L.	Commercial	Aerial parts	n.a	Spray-drying	Skimmed milk powder and whey protein	57
	-	<i>Origanum vulgare</i> L.	Commercial	Flowers and leaves	Water	Spray-drying	Arabic gum, modified starch and maltodextrin	59
	-	<i>Origanum vulgare</i> L.	Portugal	Flowers and leaves	Water	Supercritical fluid impregnation	Sorghum and rice starch and supercritical CO ₂	62
Fatty acid	α -Linoleic acid	<i>Lepidium sativum</i> Linn.	India	Seed	Hexane	Freeze-drying	Gum ghatti and arabic and soy protein	102
	ω -3 fatty acids	-	Commercial		n.a	Liposomes	Soybean phospholipids	129
	ω -3 Fatty acids	-	Commercial		n.a	Spray-drying	Lecithin and chitosan	66
Fatty acid extracts	-	-	Commercial		n.a	Emulsion	Soy protein and egg albumin.	119
	-	-	Commercial		n.a	Spray-drying	Gum arabic, maltodextrin, methyl cellulose and whey protein	63
	-	<i>Hibiscus cannabinus</i> L.	Japan	Seeds	Hexane	Spray-drying	Sodium caseinate and maltodextrin	64
	-	-	Commercial		n.a	Spray-drying	Gum arabic and maltodextrin	65
Mixtures of bioactives	Fish oil, phytosterols (5 α -cholestane, β -sitosterol, campesterol and stigmasterol) and limonene	-	Commercial		n.a	Emulsion/Spray-drying	Milk proteins	108
	Fish oil, resveratrol and tributyrin	-	Commercial		n.a	Emulsion	Caseinate, glucose and starch	112
Oil extracts	-	-	Commercial		n.a	Emulsion	Non-ionicsurfactant (Tween 20,80 and 85) and solvents (sodium	120

	-	-	Commercial		n.a	Emulsion/Spray-chilling	phosphate buffer) PGPR, FHCO and gelatinized sweet potato starch	150
	-	<i>Ocimum basilicum L.</i>	Commercial	Flowers and leaves	Water	Spray-drying	Gum arabic	60
Oils	Olive oil	-	Commercial		n.a	Co-Extrusion	Alginate	123
Organic acids	Citric acid	-	Commercial		n.a	Microwave	Casein and inulin	142
	(-)-Hydroxycitric acid	<i>Garcinia cowa</i> Roxb	India	Fruit rinds	Water	Spray-drying	Whey protein and maltodextrin	83
	(-)-Hydroxycitric acid	<i>Garcinia cowa</i> Roxb	India	Fruit rinds	Water	Freeze-drying	Whey protein and maltodextrin	99
	(-)-Hydroxycitric acid	<i>Garcinia cowa</i> Roxb.	India	Fruit	Water	Spray-drying	Whey protein	84
Organosulfur compounds	Allicin	<i>Allium sativum</i>	China	Bulb cloves	n.a	Fluidized bed	Ethyl cellulose in acetone and isopropanol	134
Phenolic compounds	Caffeine	-	Commercial		n.a	Spray-drying	Whey proteins and alginate	157
	Catechins	<i>Camellia sinensis L.</i>	Korea	Tea	n.a	Freeze-drying	Maltodextrin	96
	Chlorogenic acid	<i>Nicotiana tabacum L.</i>	China	Leaves	Ethanol	Inclusion	Cyclodextrin	158
	Ellagic acid	-	Commercial		n.a	Liposomes	Lecithin/Chitosan-Dextran sulphate	126
	Gallic acid	-	Commercial		n.a	Lyophilization	Chitosan, β -cyclodextrin and xanthan	140
	Gallic acid	-	Commercial		n.a	Spray drying	Mucilage extract of <i>Opuntia ficus indica</i>	72
	Gallic acid	-	Commercial		n.a	Spray drying	Native and acetylated starch and inulin	73
	Isoflavone	-	Commercial		n.a	Emulsion	Polyglycerol monostearate	116
	Mangiferin	<i>Mangifera indica L.</i>	Brazil/commercial	Bark	Hexane	Spray drying	Pectin and chitosan	74
	Naringenin and quercetin	-	Commercial		n.a	Spray drying	Cellulose acetate phthalate	75
	Quercetin	-	Commercial		n.a	Nanoprecipitation	Eudragit® E and Polyvinyl alcohol	139
	Quercetin and vanillin	-	Commercial		n.a	Spray drying	Sodium alginate, methyl- β - cyclodextrin, hydroxypropylmethylcellulose and inulin	81

Quercitrin		<i>Albizia chinensis</i> L.	India	Flowers	Water/methanol (90:10, v/v)	Solvent evaporation	Poly-D,L-lactide (PLA)	145
Resveratrol		<i>Arachis hypogaea</i> L.	Korea	Sprout	n.a	Response surface methodology	Medium-chain triacylglycerol/ whey protein, maltodextrin and gum arabic	144
Resveratrol		<i>Polygonum cuspidatum</i> Siebold & Zucc	Italy	Roots	Methanol	Ultrasound	Cyclodextrins	132
Rutin and anthocyanins		<i>Hibiscus sabdariffa</i> L.	Nigeria	Dried calyx	Water	Spinning disc reactor	High and low HLP lypophilic polimeric emulsifiers	135
Phytosterols ester extract	-	-	Commercial		n.a	Inclusion	Amylose, amylopectin and amylose maize starch	153
Polyphenol and betalain extract	-	<i>Opuntia ficus-indica</i>	Chile	Fruits	Juice and ethanol	Spray drying	Maltodextrin or inulin	80
Polyphenol and oil extracts	-		Commercial		n.a	Liposomes	DPPC and PEG ₂₀₀₀ -DSPE	128
Polyphenol extracts	-	<i>Achillea millefolium</i> L.	Croatia	Aerial parts	Water	Electrostatic extrusion	Alginate–chitosan	105
	-	<i>Aristotelia chilensis</i> [Molina] Stuntz	Chile	Leaves	Ethanol/water (40:60, v/v)	Emulsion	Gum arabic and liquid vaseline	115
	-	<i>Cabernet Sauvignon</i>	Argentina	Fruits	Juice (wine)	Freeze-drying	Maltodextrin	98
	-	<i>Camellia sinensis</i> L.	China	Leaves	Ethanol	Internal gelation	Chitosan	107
	-	<i>Crategus laevigata</i> (Poir.) Dc.	Croatia	Aerial parts	Water	Electrostatic extrusion	Alginate–chitosan	105
	-	<i>Glechoma hederacea</i> L.	Croatia	Aerial parts	Water	Electrostatic extrusion	Alginate–chitosan	105
	-	<i>Hypericum perforatum</i> L.	Greece	Leaves and flowers	Methanol	Molecular inclusion	β-cyclodextrin	155
	-	<i>Ilex paraguariensis</i> A. St. Hil.	Argentina	Aerial parts	Water	Alginate beads	Ca-alginate and Ca-alginate-chitosan	84
	-	<i>Myrica</i> genus	China	Fruits	Ethanol	Phase separation method	Ethyl cellulose	143
	-	<i>Olea europea</i> L.	Croatia	Leaves	Water	Electrostatic extrusion	Alginate–chitosan	105
	-	<i>Orthosiphon stamineus</i> Benth	Malasya	Leaves	Water:Methanol (50:50, v/v)	Spray drying	Whey protein and maltodextrin	79
	-	<i>Prunus cerasus</i> L.	Turkey	Pomace	Ethanol/Water (50:50, v/v)	Ultrasonication	Maltodextrin and gum arabic	131
	-	<i>Punica granatum</i> L.	Turkey	Peels	Water	Spray drying	Maltodextrin	77
	-	<i>Punica granatum</i> L.	Chile	Fruits	Ethanol and juice	Spray-drying	Maltodextrin or soybean protein	73
	-	<i>Quercus resinosa</i> Liebm.	México	Leaves	Water	Spray drying	k-Carrageenan and maltodextrin	73

-		<i>Ribes nigrum</i> L.	Canada	Pomace	Ethanol/water/citric acid (80:20 v/v, 5%)	Spray drying	Maltodextrin and inulin	76
-		<i>Rosmarinus officinalis</i> L.	Spain	Leaves	Ethanol	Supercritical antisolvent process	Poloxamers	87
-		<i>Rubus chamaemorus</i> L.	Finland	Fruits	Water/acetone (70:30, v/v)	Freeze-drying	Maltodextrin	97
-		<i>Rubus idaeus</i> L.	Croatia	Leaves	Water	Electrostatic extrusion	Alginate–chitosan	105
-		<i>Rubus ulmifolius</i> Schott	Portugal	Flowers	Methanol/water (80:20, v/v)	Atomization/coagulation	Alginate	92
-		<i>Urtica dioica</i> L.	Croatia	Leaves	Water	Electrostatic extrusion	Alginate–chitosan	105
-		<i>Vaccinium myrtillus</i> L.	Commercial	Fruits	n.a	Emulsion	Whey protein	117
-		<i>Vitis labrusca</i> L.	Brazil	Seeds and fruits	Water:ethanol (67.6:32.4, v/v)	Spray-drying	Maltodextrin	86
-		<i>Vitis vinifera</i> L.	Germany	Seed	Buffer acetate	Liposomes	Soy lecithin	125
-		-	Commercial		n.a	Electrostatic extrusion	Ethylene vinyl acetate and low-density polyethylene	122
-		-	Commercial		n.a	Liposomes	Labrafac™, Phospholipon® 90G, Solutol® H515	125
-		-	Commercial		n.a	Niosomes	Tween 60	156
Protein extracts	-	<i>Pisum sativum</i> L.	Commercial	Grain	n.a	Emulsion/Spray drying	Starch hydrolysates	152
	-	-	Commercial		n.a	Core–Shell Printing	Stearic acid and carnauba wax	138
Proteins	Albumin and hirudin	-	Commercial		n.a	Atomization/coagulation + surface modification	Chitosan/calcium alginate	93
	Papain	-	Commercial		n.a	Alginate beads	Flamboyant tree seed gum	91
Sugars	Glucose	-	Commercial		n.a	Co-Extrusion	Alginate	123
Vitamin and enzyme extracts	-	-	Commercial		n.a	Emulsion	Calcium caseinate	160
Vitamin extracts	-	<i>Capsicum annum</i> L. variety Piquillo	Spain	Seeds, skin and stems	CO ₂	Spray-drying	Gum arabic	88
Vitamins	Cobalamin (vitamin B ₁₂)	-	Commercial		n.a	Co-Extrusion	Alginate	123
	Folic acid	-	Commercial		n.a	Electrospraying and nanospray drying	Whey protein and commercial starch	103
	Folic Acid	-	Commercial		n.a	Solvent evaporation	Ethyl cellulose	146
	Riboflavin (Vitamin B ₂)	-	Commercial		n.a	Emulsion	Alginate–whey protein	113

Riboflavin (Vitamin
B₂) -

Commercial

n.a

Alginate beads

Alginate-whey protein

89
