Table S1. Antidiabetic nanoformulations of crude natural products.

S. no	Plants	Nanoformulations	Models	Size (nm)	Outcomes	References
1	*Allium cepa* bulb	*A. cepa*-silver nanoparticles	*In vitro* assays	~49-73	Free radical ↓, α-glucosidase ↓, α-glucosidase ↓, cytotoxicity ↓.	[1]
2	*Ananas comosus* outer peel	*A. comosus*-silver nanoparticles	*In vitro* assays	-	Free radical ↓, reducing power ↑, NO ↓, α-glucosidase ↓.	[2]
3	*Andrographis echioides (*Syn: *Indoneesiella echioides)* whole plant	*A. echioides*-silver nanoparticles	Streptozotocin-diabetic male rats	-	Plasma glucose ↓, plasma insulin ↑, plasma hemoglobin ↑, plasma glycated hemoglobin ↓, plasma free fatty acids ↓, plasma phospholipids ↓, plasma triglycerides ↓, plasma cholesterol ↓, plasma HDL-cholesterol ↑, plasma LDL-cholesterol ↓, plasma VLDL-cholesterol ↓, serum AST ↓, serum ALT ↓, serum ALP ↓, serum GGT ↓, plasma urea ↓, plasma uric acid ↓, plasma creatinine ↓, plasma protein ↑, HK (liver and kidney) ↑, GK (liver and kidney) ↑, G6P (liver and kidney) ↑, G1,6DP (liver and kidney) ↑, G6PD (liver and kidney) ↑, lipid peroxidation (pancreas, liver, and kidney) ↓, hydroperoxides (pancreas, liver, and kidney) ↓, antioxidant enzymes (pancreas, liver, and kidney) ↑, GSH (pancreas, liver, and kidney) ↑, Vit C (pancreas, liver, and kidney) ↑, Vit E (pancreas, liver, and kidney) ↑.	[3]

4	*Andrographis paniculata* leaf & herb	*A. paniculata*-gold nanoparticles	*In vitro* assays	~57-115	α-Amylase ↓, free radicals ↓, reducing power ↓, inflammation ↓, NO ↓.	[4,5]
		A. paniculata-casein micelle nanopreparation	*In vitro* assay	~120	α-Glucosidase ↓.	
5	*Antrodia cinnamomea* tritepenoids	*A. cinnamomea* triterpenoids-silica-chitosan nanoparticles	*In vitro* assays	~79	Cellular uptake ↑, cyto-toxicity ↓, inflammation ↓, NO ↓, superoxide ↓.	[6]
			Streptozotocin-diabetic male rats		Blood glucose ↓, insulin resistance ↓, testicular SOD ↑, testicular GPx ↑, testicular CAT ↑, testicular IL-6 ↓, testicular TNF-α ↓, plasma IFN-γ ↓, plasma LH ↑, plasma testosterone ↑, plasma FSH ↑, ASK-1 ↓, c-JNK ↓, ATF-2 ↓, sperm count ↑, sperm mobility ↑, sperm abnormality ↓, sperm ROS ↓, sperm mitochondrial membrane potential ↑.	
6	*Argyreia nervosa* leaf	*A. nervosa*-silver nanoparticles	*In vitro* assays	~5-40	α-Glucosidase ↓, α-amylase ↓, free radical ↓.	[7]
7	*Avicennia officinalis* leaf	*A. officinalis*-silver nanoparticles	*In vitro assays*	~181	α-Glucosidase ↓, α-amylase ↓, free radicals ↓, inflammation ↓.	[8]
8	*Azadirachta indica* leaf	*A. indica*-zinc oxide nanoparticles	*In vitro assays*	~27-54	α-Glucosidase ↓, α-amylase ↓, free radicals ↓, H_2O_2 ↓.	[9]
9	*Barleria prionitis* leaf	*B. prionitis*-copper nanoparticles	*In vitro assays*	~11-15	α-Glucosidase ↓, α-amylase ↓.	[10]
10	*Bauhinia variegate* flower	*B.variegata*-silver nanoparticles	*In vitro assays*	~5-15	α-Amylase ↓, free radicals ↓.	[11]
11	*Botryodiplodia theobromae,* endophytic fungi	*B. theobromae*-silver nanoparticles	*In vitro assay*	~53-79	α-Amylase ↓.	[12]

12	*Breynia retusa* leaf	*B. retusa*-silver nanoparticles	*In vitro* assays	~30-40	α-Amylase ↓.	[13]
13	*Caesalpinia coriaria* leaf and bark	*C. coriaria*-silver nanoparticles	*In vitro* assays	-	Glucose uptake (yeast cells) ↑, inflammation ↓.	[14]
14	*Calophyllum tomentosum* leaf	*C. tomentosum*-silver nanoparticles	*In vitro* assays	~24	Free radicals ↓, reducing power ↑, NO ↓, inflammation ↓, lipoxygenase ↓, xanthine oxidase ↓, α-glucosidase ↓, DPP-4 ↓, α-amylase ↓.	[15]
15	*Cassia fistula* bark	*Cassia fistula*-gold nanoparticles	Streptozotocin-diabetic male rats	~55-98	Blood glucose ↓, serum triglycerides ↓, serum cholesterol ↓, serum HDL-cholesterol ↑, serum LDL-cholesterol ↓, serum VLDL-cholesterol ↓, serum AST ↓, serum ALT ↓, serum ALP ↓, serum urea ↓, serum uric acid ↓, serum creatinine ↓.	[16]
16	*Cassia grandis* fruit	*C. grandis*-Eudragit L 100 55-PEG 4000-Kollicoat nanodispersion	*In vitro* assays Alloxan-diabetic mice	~106	Stability ↑, lipase ↓, α-glucosidase ↓, free radicals ↓, cyto-toxicity ↓. Blood glucose ↓, body weight ↑, food intake ↑, water intake ↓.	[17]
17	*Catathelasma ventricosum* polysaccharides	*C. ventricosum polysaccharides*-selenium nanoparticles	Streptozotocin-diabetic mice	~50	Blood glucose ↓, body weight ↑, serum triglycerides ↓, serum cholesterol ↓, serum HDL-cholesterol ↑, serum LDL-cholesterol ↓, lipid peroxidation (liver and kidney), SOD (liver and kidney), CAT (liver and kidney), GPx (liver and kidney).	[18]
18	*Catharanthus roseus var. alba* leaf	*C. roseus*-chitosan nanoparticles	Alloxan-diabetic rats	-	Blood glucose ↓, glucose tolerance ↑, body weight ↑, SOD (plasma and liver) ↑, CAT (plasma and liver) ↑, GSH	[19]

					(plasma and liver) ↑.	
19	*Centella asiatica* leaf	*C. asiatica*-silver nanoparticles	*In vitro* assays	~30-50	Glucose uptake (yeast cells) ↑, non-enzymatic hemoglobin glycosylation ↓, hemoglobin ↑, α-amylase ↓, free radicals ↓, H_2O_2 ↓.	[20]
20	*Chamaecostus cuspidatus* leaf	*C. cuspidatus*-gold nanoparticles	*In vitro* assays	~50	Free radicals ↓, reducing power ↑, NO ↓, lipid peroxidation ↓.	[21]
			Streptozotocin-diabetic male rats		Blood glucose ↓, insulin ↑, glycogen ↑, body weight ↑, serum protein ↑, serum cholesterol ↓, diabetic wound ↓.	
21	*Chromolaena odorata* leaf	*C. odorata*-silver nanoparticles	*In vitro* assays	-	Glucose uptake (yeast) ↑, inflammation ↓.	[14]
22	*Cinnamomum cassia* bark	*C. cassia*-silver-gold nanoparticles	Streptozotocin-diabetic male rats	~45	Blood glucose ↓, insulin sensitivity ↑, body weight ↓.	[22]
		C. cassia-silver nanoparticles	Streptozotocin-diabetic male rats	~100	Blood glucose ↓, serum urea ↓, serum creatinine ↓, serum AST ↓, serum ALT ↓, serum ALP ↓, lipid peroxidation (kidney) ↓, GSH (kidney) ↑, body weight ↑.	[23]
23	*Cinnamomum tsoi* leaf	*C. tsoi*-silver nanoparticles	*In vitro* assays	~10-30	α-Glucosidase ↓, α-amylase ↓.	[24]
24	*Citrus limon* fruit	*C. limon*-zinc oxide nanoparticles	*In vitro* assays	~11-49	α-Glucosidase ↓, cyto-toxicity ↓.	[25]
25	*Cladosporium* species	*Cladosporium* species-silver nanoparticles	*In vitro* assays	~24	DPP-4 ↓, α-glucosidase ↓, α-amylase ↓, glucose uptake (3T3L1 adipocytes) ↑, antioxidant activity ↑.	[26]
26	*Clausena anisata* root	*C. anisata*-silver nanoparticles	*In vitro* assays	~33	Glucose uptake (yeast cells) ↓, glucose diffusion ↓, α-amylase ↓, glucose binding ↑, free radical ↓.	[27]
	Clausena anisata leaf	*C. anisata*-silver nanoparticles	*In vitro* assays	~61	Glucose uptake (yeast cells) ↓, glucose	[28]

					diffusion ↓, α-amylase ↓, glucose binding ↑, free radical ↓.	
27	*Colpomenia sinuosa,* marine algae	*C. sinuosa*-silver nanoparticles	*In vitro* assays	~54-65	α-Glucosidase ↓, α-amylase ↓.	[29]
28	*Corchorus depressus* whole plant	*C. depressus*-silver nanoparticles	*In vitro* assays	~2-10	α-Glucosidase ↓.	[30]
29	*Costus igneus* leaf	*C. igneus*-zinc oxide nanoparticles	*In vitro* assays	~27	Free radicals ↓, α-glucosidase ↓, α-amylase ↓.	[31,32]
		C. igneus-gold nanoparticles	*In vitro* assay	~50-60	Glucose concentration ↓.	
30	*Costus pictus* leaf	*C. pictus*-silver nanoparticles	*In vitro* assays	-	Glucose uptake (yeast cells) ↓, non-enzymatic hemoglobin glycosylation ↓, α-glucosidase ↓, α-amylase ↓.	[33]
31	*Costus speciosus* leaf	*C. speciosus*-loaded PLGA nanoparticles	Streptozotocin-diabetic male rats	~4-12	Sustained release ↑, therapeutic dose ↓, blood glucose ↓, serum triglycerides ↓, serum cholesterol ↓, serum HDL-cholesterol ↑, serum LDL-cholesterol ↓, serum AST ↓, serum ALT ↓, serum LDH ↓, serum ALP ↓, serum ACP ↓, hepatocellular DNA damage ↓, pancreatic insulin-I mRNA ↑, pancreatic insulin-II mRNA ↑, hepatic GLUT-2 mRNA ↑, muscular GLUT-4 mRNA ↑.	[34,35]
		C. speciosus-platinum modified titanium dioxide nanoparticles	*In vitro* assays	~10-50	Free radicals ↓, H_2O_2 ↓, reducing power ↑, α-amylase ↓.	
32	*Couroupita guianensis* flower	*C. guianensis*-coated gold nanoparticles	Streptozotocin-diabetic rats	~47	Blood glucose ↓, glycated haemoglobin ↓, serum insulin ↑, serum triglycerides ↓, serum cholesterol ↓, serum HDL-	[36]

					cholesterol ↑, serum AST ↓, serum ALT ↓, serum ALP ↓, serum urea ↓, serum creatinine ↓, serum bilirubin ↓, serum protein ↑, SOD (liver) ↑, CAT (liver) ↑, GPx (liver) ↑, lipid peroxidation (liver) ↓.	
33	*Curcuma longa* leaf	*C. longa*-silver nanoparticles	*In vitro* assays	~90-111	Free radicals ↓, reducing power ↑, α-amylase ↓, NO ↓.	[37]
34	*Cymbopogon citratus* leaf	*C. citratus*-silver nanoparticles	*In vitro* assays	~75-138	α-Amylase ↓, glucose diffusion ↓.	[38]
35	*Dioscorea bulbifera* tuber	*D. bulbifera*-copper nanoparticles	*In vitro* assays	~12-16	Free radicals ↓, α-glucosidase ↓, α-amylase ↓, NO ↓, superoxide ↓.	[39]
36	*Diospyros melanoxylon* leaf	*D. melanoxylon*-PLGA nanoparticles	*In vitro* assays	~366	α-Glucosidase ↓, α-amylase ↓.	[40]
37	*Dunaliella bardawil* biomass	*Dunaliella bardawil*-encapsulated keratin nanoparticles	*In vitro* (3T3-L1 adipocytes), *in silico* assays	~159	Stability ↑, sustained release of *D. bardawil* biomass ↑, glucose uptake ↑, PTP1B ↓, AMPK ↑, GLUT-4 translocation ↑, cytotoxicity ↓.	[41]
38	*Enhalus acoroides*, sea grass	*E. acoroides*-silver nanoparticles	*In vitro* assay	~2-100	α-Glucosidase ↓.	[42]
39	*Eysenhardtia polystachya* bark	*E. polystachya*-silver nanoparticles	*In vitro* assays Glucose-fed zebrafish	~10-100	Stability ↑, sustained release of *E. polystachya* ↑, β-cell survival ↑, Insulin secretion ↑, cyto-toxicity ↓. Glucose ↓, triglycerides ↓, cholesterol ↓.	[43]
40	*Gnidia glauca* flower, leaf, stem	*G. glauca* flower-copper nanoparticles *G. glauca* leaf-copper nanoparticles *G. glauca* stem-copper nanoparticles	*In vitro assays*	~5 ~70-93 -	α-Glucosidase ↓, α-amylase ↓.	[44]

41	*Gymnema sylvestre* leaf	*G. sylvestre*-chitosan nanoparticles	Streptozotocin-diabetic male rats	~50-120	Blood glucose ↓, glyoxylated haemoglobin ↓, AST ↓, ALT ↓, ALP ↓, GSH (liver & kidney) ↑, SOD (liver & kidney) ↑, CAT (liver & kidney) ↑, lipid peroxidation (liver & kidney) ↓.	[45-48]
		G. sylvestre-gold nanoparticles	Alloxan-diabetic mice	~50	Blood glucose ↓, plasma insulin ↑, plasma glycated haemoglobin ↓, plasma haemoglobin ↑, plasma triglycerides ↓, plasma cholesterol ↓, plasma HDL-cholesterol ↑, plasma LDL-cholesterol ↓, plasma TNF-α ↓, plasma IL-1β ↓, plasma IL-6 ↓.	
		G. sylvestre-chitosan reduced gold nanoparticles	High fat diet + low dose streptozotocin-diabetic rats	~14	Hyperglycemia ↓, hyperlipedimia ↓, vascular tissue damage ↓, GLUT-4 ↑, PPAR-γ ↑.	
		G. sylvestre-silver nanoparticles	Streptozotocin-diabetic male rats	-	Blood glucose ↓, serum cholesterol ↓, serum triglycerides ↓, serum LDL-cholesterol ↓, serum VLDL-cholesterol ↓.	
42	*Halymenia poryphyroides* algae	*H. poryphyroides*-silver nanoparticles	*In vitro* assays	~34-80	α-Glucosidase ↓, α-amylase ↓.	[49]
43	*Helianthus tuberosus* tuber	*H. tuberosus*-gold nanoparticles	Glucose-fed rats	~10	Glucose tolerance ↑, blood glucose ↓.	[50]
44	*Heritiera fomes* bark	*H. fomes*-silver nanoparticles *H. fomes*-zinc oxide nanoparticles	*In vitro assays*	~400 (WR) ~40-50	α-Amylase ↓, free radical ↓, inflammation ↓.	[51]
45	*Hibiscus rosa-sinensis* leaf	*H. rosa-sinensis*-zinc oxide nanoparticles	*In vitro assays*	~27-54	α-Glucosidase ↓, α-amylase ↓, free radicals ↓, H_2O_2 ↓.	[9]
46	*Hibiscus subdariffa* leaf	*Hibiscus subdariffa*-zinc oxide nanoparticles	Streptozotocin-diabetic male rats	~16-60	Blood glucose ↓, pancreatic TNF-α protein and gene ↓, pancreatic IL-6	[52]

					protein and gene ↓, pancreatic IL-1β protein and gene ↓, pancreatic IL-4 protein and gene ↑, pancreatic IL-10 protein and gene ↑, pancreatic IR A mRNA ↑, pancreatic PKLR mRNA ↓, pancreatic GLUT-2 ↑, pancreatic GK mRNA ↑,	
47	*Holoptelea integrifolia* leaf	*H. integrifolia*-silver nanoparticles	*In vitro* assays	~32-38	Free radical ↓, metal chelating ↑, NO ↓, inflammation ↓, α-amylase ↓.	[53]
48	*Ipomoea batatas* peels Korean red skin sweet potato variety (IB1), Korean pumpkin sweet potato variety (IB2)	IB1-silver nanoparticles and IB2-silver nanoparticles	*In vitro* assays	-	Free radical ↓, α-glucosidase ↓ (IC50 = 0.36 and 0.77 μg/ml for IB1-silver and IB2-silver nanoparticles, respectively), cyto-toxicity ↓.	[54]
49	*Lawsonia inermis* leaf	*L. inermis*-silver nanoparticles *L. inermis*- cerium oxide nanoparticles	Streptozotocin-diabetic male rats	~15 ~18	Blood glucose ↓, serum insulin ↑, serum triglycerides ↓, serum cholesterol ↓, serum HDL-cholesterol ↑, serum LDL-cholesterol ↓, serum VLDL-cholesterol ↓. (silver nanoparticles effect > cerium oxide nanoparticles effect)	[55]
50	*Lentinus tuber-regium*, musroom	*L. tuber-regium*-silver nanoparticles	*In vitro assays*	~5-35	α-Amylase ↓.	[56]
51	*Litchi chinensis* peel	*L. chinensis*-copper nanoparticles	*In vitro assays*	~10-100	α-Glucosidase ↓, α-amylase ↓.	[10]
52	*Lonicera japonica* leaf	*L. japonica*-silver nanoparticles	*In vitro* assays	~20-60	Free radicals ↓, α-glucosidase ↓, α-amylase ↓.	[57]
53	*Manilkara zapota* leaf and stem	*M. zapota*-silver nanoparticles	*In vitro* assays	-	Free radicals ↓, reducing power ↑, α-amylase ↓.	[58]

54	*Marsilea quadrifolia*, water fern	*M. quadrifolia*-gold nanoparticles	*In vitro* assays	~14	Glucose uptake (3T3L1 adipocytes) ↑, cyto-toxicity (3T3L1 adipocytes) low.	[59]
55	*Momordica charantia* fruit	*M. charantia*-silver nanoparticles	Streptozotocin-diabetic rats	~100	Blood glucose ↓, insulin ↑.	[60,61]
		M. charantia-zinc oxide nanoparticles	Streptozotocin-diabetic rats	~25	Blood glucose ↓, insulin ↑.	
56	*Moricandia nitens* whole plant	*M. nitens*-gold nanoparticles	*In vitro* assay	~5-30	α-Glucosidase ↓.	[62]
57	*Moringa oleifera* leaf	*M. oleifera*-zinc oxide nanoparticles	*In vitro assays*	~27-54	α-Glucosidase ↓, α-amylase ↓, free radicals ↓, H_2O_2 ↓.	[9]
58	*Morus nigra* fruit	*Morus nigra*- cerium oxide nanoparticles	*In vitro* assays	~7.5	Glucose uptake (L6 skeletal muscle cells) ↑, cyto-toxicity ↓.	[63]
59	*Morus alba* leaf + *Pueraria Lobata*	Selenium-layered *M.alba -P. Lobata*-PLGA-PEG-DOTAP nanoparticles	*In vitro* assays Sprague-Dawley rats Goto-Kakizaki diabetic rats	~120	Stability ↑, sustained release ↑, cellular uptake ↑, glucose uptake (adipocytes) ↑. Bioavailability ↑, blood glucose ↓. Blood glucose ↓, β-cells ↑, blood ROS ↓, blood lipid peroxidation ↓, blood SOD ↑, blood GPx ↑, blood GSH ↑.	[64]
60	*Murraya koenigii* leaf	*M.* koenigii-zinc oxide nanoparticles	*In vitro assays*	~27-54	α-Glucosidase ↓, α-amylase ↓, free radicals ↓, H_2O_2 ↓.	[9]
61	*Nasturtium officinale* leaf	*N. officinale*-zinc oxide nanoparticles	Alloxan-diabetic rats	~14	Stability ↑, blood glucose ↓, insulin ↑, triglycerides ↓, cholesterol ↓, HDL-cholesterol ↑.	[65]
62	*Nigella Sativa* seed	*N. Sativa*-PLGA nanoparticles	High fat diet + low dose streptozotocin-diabetic rats	~50-94	Ischemia-modified albumin ↓, lipid peroxidation ↓ (insignificant).	[66]
63	*Nilgirianthus ciliates* fresh plant	*N. ciliates*-loaded gelatin nanoparticles	*In vitro* assays	~116-160	Stability ↑, cyto-toxicity ↓, glucose uptake (L6 skeletal muscle cells) ↑,	[67]

					adipogenesis (3T3-L1 adipocytes) ↓, lipid accumulation (3T3-L1 adipocytes) ↓.	
64	*Ocimum basilicum* leaf	*O. basilicum*-silver nanoparticles	*In vitro* assays	~100	α-Glucosidase ↓, α-amylase ↓.	[68,69]
		O. basilicum-silver-gold nanoparticles	*In vitro* assays	~3-25	α-Glucosidase ↓, α-amylase ↓.	
65	*Ocimum sanctum* leaf	*O. sanctum*-silver nanoparticles	*In vitro* assays	~100	α-Glucosidase ↓, α-amylase ↓.	[68]
67	*Padina boergesenii,* brown seaweed	*P.boergesenii*-gold nanoparticles	*In vitro* assay	~2-100	α-Glucosidase ↓.	[70]
68	*Parmelia perlata* lichen	*P. perlata*-silver nanoparticles	*In vitro* assays	~10-100	α-Amylase ↓, antioxidant activity ↑, reducing power ↑, H_2O_2 ↓.	[71]
69	*Phyllanthus emblica* fruit	*P. emblica*-PLGA nanoparticles	Streptozotocin-diabetic rats	-	Blood glucose ↓, hepatic DNA damage ↓, hepatocellular GK mRNA ↑, hepatic hepatic G6Pase mRNA ↓, GLUT-2 mRNA ↑, muscular GLUT-4 mRNA ↑, GPx ↑.	[72]
70	*Pisum sativum* outer peel	*P. sativum*-silver nanoparticles	*In vitro* assays	~10-25	α-Glucosidase ↓, free radical ↓.	[73]
71	*Platanus orientalis* leaf	*P. orientalis*-copper nanoparticles	*In vitro assays*	~90-200	α-Glucosidase ↓, α-amylase ↓.	[10]
72	*Pleurotus giganteus*, mushroom	*P. giganteus*-silver nanoparticles	*In vitro assays*	~2-20	α-Amylase ↓.	[74]
73	*Plicosepalus acacia* whole plant	*P. acacia*-solid lipid nanoparticles	High fat diet + low dose streptozotocin-diabetic rats	~22-70	Blood glucose ↓, glycated haemoglobin ↓, insulin resistance ↓, insulin sensitivity ↑, lipid peroxidation ↓, GSH ↑, SOD ↑, CAT ↑.	[75]
74	*Plicosepalus curviflorus* whole plant	*P. curviflorus*-solid lipid nanoparticles	High fat diet + low dose streptozotocin-	~22-70	Blood glucose ↓, glycated haemoglobin ↓, insulin resistance ↓, insulin sensitivity	[75]

			diabetic rats		↑, lipid peroxidation ↓, GSH ↑, SOD ↑, CAT ↑.	
75	*Plumbago zeylanica* leaf	*P. zeylanica* leaf-copper nanoparticles	*In vitro* assays	~1-5	α-Glucosidase ↓, α-amylase ↓.	[44]
77	*Pouteria sapota* leaf	*P. sapota*-silver nanoparticles	*In vitro* assay	~20-110	Glucose uptake ↑, non-enzymatic hemoglobin glycosylation ↓, α-glucosidase ↓.	[76]
			Streptozotocin-diabetic rats		Blood glucose ↓, serum insulin ↑, serum AST ↓, serum ALT ↓, serum ALP ↓, serum urea ↓, serum uric acid ↓, serum creatinine ↓, serum bilirubin ↓, serum protein ↑, SOD (liver) ↑, CAT (liver) ↑, lipid peroxidation (liver) ↓.	
78	*Psoralea corylifolia* seed	*P. corylifolia*-silver nanoparticles	*In vitro* assay	~15-25	PTP1B ↓.	[77]
79	*Pterocarpus marsupium* bark and wood	*P. marsupium*-silver nanoparticles	*In vitro* assay	~148.5	α-glucosidase ↓.	[78]
80	*Pterocarpus santalinus* wood	*P. santalinus*-zinc oxide nanoparticles	*In vitro* assays	~20	α-Glucosidase ↓, α-amylase ↓.	[79]
81	*Punica granatum* leaf	*P. granatum*-silver nanoparticles	*In vitro* assays	~35-60	Free radicals ↓, α-glucosidase ↓, α-amylase ↓.	[80]
83	*Rumex hymenosepalus* root	*R. hymenosepalus*-silver nanoparticles	Streptozotocin-diabetic rats	~6-12	Blood glucose ↓, glucose tolerance ↑.	[81]
84	*Sambucus nigra* fruit	*S. nigra*-gold nanoparticles	Streptozotocin-diabetic rats	~4-26	Blood glucose ↓ (insignificant), serum insulin ↑ (insignificant), serum cholesterol ↓ (insignificant), serum AST ↓, lipid peroxidation (liver) ↓, GSH/GSSG (blood) ↑, COX-2 (liver) ↓, Pro-MMP-2 (liver) ↓, Kupffer cells ↓.	[82]

85	*Saraca asoca* leaf	*S. asoca*-gold nanoparticles *S. asoca*-silver nanoparticles	*In vitro* assay	~24 ~36	α-Amylase ↓ (IC_{50}: 1.5 mM) α-Amylase ↓ (IC_{50}: 0.35 mM)	[83]
86	*Sargassum swartzii*	*S. swartzii*-gold nanoparticles	Alloxan-diabetic rats	~37	Blood glucose ↓, glycated haemoglobin ↓, haemoglobin ↑, plasma insulin ↑, serum triglycerides ↓, serum cholesterol ↓, serum HDL-cholesterol ↑, serum LDL-cholesterol ↓, serum AST ↓, serum ALT ↓, serum ALP ↓, serum creatinine ↓, serum IL-6 ↓, serum TNF-α ↓, serum high-sensitive CRP ↓.	[84]
87	*Sesamum indicum* seed	*S. indicum*-iron nanoparticles	*In vitro* assay	~99	α-Amylase ↓.	[85]
88	*Silybum marianum* seed	*S. marianum*-zinc oxide nanoparticles	Alloxan-diabetic rats	~25	Blood glucose ↓, serum insulin ↑, serum triglycerides ↓, serum cholesterol ↓, serum HDL-cholesterol ↑.	[86]
89	*Solanum nigrum* leaf	*S. nigrum*-silver nanoparticles	Alloxan-diabetic rats	~4-25	Blood glucose ↓, glucose tolerance ↑, body weight ↑, serum triglycerides ↓, serum cholesterol ↓.	[87]
90	*Sonneratia apetala* leaf	*S. apetala*-silver nanoparticles *S. apetala*-zinc oxide nanoparticles	*In vitro assays*	~20-100 ~400-500	α-Amylase ↓, free radical ↓, inflammation ↓.	[51]
91	*Sphaeranthus Amaranthoides* whole plant	*S. amaranthoides*-silver nanoparticles	*In vitro* assay	~50-150	α-Amylase ↓.	[88]
92	*Stevia rebaudiana* leaf	*S. rebaudiana*-tripolyphosphate-chitosan nanoparticles	Streptozotocin-diabetic rats	~327	Blood glucose ↓, serum insulin ↑, serum AST ↓, serum ALT ↓, serum ALP ↓, SOD (liver and kidney) ↑, CAT (liver and kidney) ↑, GSH (liver and kidney) ↑, lipid peroxidation (liver and kidney) ↓.	[89,90]
		S. rebaudiana-titanium oxide nanoparticles	Alloxan-diabetic rats	~4-100	Blood glucose ↓, glycated haemoglobin ↓, serum insulin ↑, serum triglycerides	

					↓, serum cholesterol ↓, body weight ↑.	
93	*Stoechospermum marginatum* seaweed	*S. marginatum*-silver nanoparticles	*In vitro* assays	-	α-Amylase ↓, cytotoxicity ↓.	[91]
94	*Syzygium cumini* seed	*S. cumini*-silver nanoparticles	*In vitro* assays Glucose-stressed H9C2 cardiac cells	~40-100	Free radicals ↓. Nuclear abnormalities ↓, cell size ↓, lipid peroxidation ↓.	[92,93]
		S. cumini polymeric nanoparticles	Streptozotocin-diabetic rats inoculated with *Candida albicans*.	-	Adenosine deaminase ↓, 5′-nucleotidase activity ↓, AMP hydrohysis ↓, NTPDase activity ↓, ADP ↓.	
95	*Syzygium jambolanum* seed	*S. jambolanum*-PLGA nanoparticles	*In vitro* assays	~122	Cyto-toxicity ↓, glucose uptake (L6 skeletal muscle cells) ↑, ROS ↓, NF-κB ↓, iNOS ↓, GK mRNA ↑, GLUT-4 protein and gene ↑.	[94]
			Arsenic-hyperglycemic mice		Blood glucose ↓, glycated haemoglobin ↓.	
96	*Talinum portulacifolium* whole plant	*T. portulacifolium* solid lipid nanoparticles	High fat diet + streptozotocin-diabetic rats	~260	Blood glucose ↓, serum triglycerides ↓, serum cholesterol ↓, serum HDL-cholesterol ↑, serum LDL-cholesterol ↓, serum AST ↓, serum ALT ↓, serum CAT ↑, serum GSH ↑, serum lipid peroxide ↓.	[95]
97	*Tamarindus indica* leaf	*T. indica*-zinc oxide nanoparticles	*In vitro assays*	~27-54	α-Glucosidase ↓, α-amylase ↓, free radicals ↓, H_2O_2 ↓.	[9]
98	*Tephrosia tinctoria* stem	*T. tinctoria*-silver nanoparticles	*In vitro* assays	< 100	α-Glucosidase ↓, α-amylase ↓, glucose uptake (erythrocytes) ↑, free radicals ↓.	[96]
99	*Tinospora cordifolia* stem	*T. cordifolia*-PLA-PVA nanoparticles	*In vitro* assays	~230	Sustained release ↑, α-glucosidase ↓.	[97]

100	*Trigonella foenum graecum* seed	*T. foenum graecum*-PLGA nanoparticles	Alloxan-diabetic male mice	-	Body mass ↑, pancreatic gland mass ↑, lipid peroxidation ↓, lipofuscin granules ↓.	[98,99]
		T. foenum graecum-silver-gold nanoparticles	Streptozotocin-diabetic rats	~73	Blood glucose ↓, serum ALT ↓, serum urea ↓, serum creatinine ↓.	
101	*Vaccinium arctostaphylos* fruit	*V. arctostaphylos*-zinc oxide nanoparticles	Alloxan-diabetic rats	~15	Blood glucose ↓, serum insulin ↑ (insignificant), serum triglycerides ↓ (insignificant), serum cholesterol ↓, serum HDL-cholesterol ↑.	[100]
102	*Withania coagulans* plant	*W. coagulans* antidiabetic fraction-chitosan assembled enteric-coated nanoparticles	*In vitro* assay Alloxan-diabetic mice	-	Insulin secretion ↑ (MIN6 cells). Blood glucose ↓, bioavailability ↑.	[101]
103	*Withania somnifera* leaf	*Withania somnifera*-platinum nanoparticles	Streptozotocin-diabetic rats	~12	Plasma glucose ↓.	[102]
104	*Withania somnifera* root	*W. somnifera*-silver nanoparticles	*In vitro* assays	~123	α-Glucosidase ↓, α-amylase ↓.	[103]
105	*Vaccinium arctostaphylos* leaf	*V. arctostaphylos*-zinc oxide nanoparticles	Alloxan-diabetic rats	~12-27	Blood glucose ↓, serum insulin ↑, serum triglycerides ↓, serum cholesterol ↓, serum HDL-cholesterol ↑.	[100,65]
106	*Xylocarpus granatum* bark	*X. granatum*-silver nanoparticles	*In vitro assays*	~99	α-Glucosidase ↓, α-glucosidase ↓, free radicals ↓, inflammation ↓.	[8]
	Natural formulations /mixtures					
107	Jiaosanxian (charcoal used in TCM)	Jiaosanxian-derived carbon dots	Glucose-hyperglycemic mice	~4.4-6.4	Solubility ↑, blood glucose ↓.	[104]
108	Ge-Gen-Qin-Lian-Tang decoction (polyherbal formulation in TCM)	Ge-Gen-Qin-Lian-Tang micro/nano-aggregates	*In vitro* assays	~300-1000	Baicalin cellular uptake ↑ (Caco-2 cells), β-cell proliferation ↑ (INS-1 cells), oxidative stress ↓ (streptozotocin-INS-1 cells), insulin secretion ↑ (glucose-INS-1	[105]

					cells)	
109	Jasada bhasma or Yashada bhasma (Ayurvedic bhasma)	Zinc-based nanoparticles	Streptozotocin-diabetic rats	~200-500	Oxidative stress ↓, Blood glucose ↓, glucose tolerance ↑, insulin sensitivity ↑.	[106]
110	Clinoptilolite, natural zeolite (Na, K, Al, and Si containing mineral linked through oxygen)	Nano-sized clinoptilolite	Streptozotocin-diabetic rats	~30-40	Blood glucose ↓, weight loss ↓, serum LDL-cholesterol ↓, serum lipid peroxidation ↓.	[107,108]

ACP: Acid phosphatase, ADP: adenosine diphosphate, ALP: Alkaline phosphatase, ALT: Alanine aminotrasferase, AMP: adenosine monophosphate, AMPK: 5' AMP-activated protein kinase, AST: Aspartate aminotransferase, CAT: catalase, COX: cyclooxygenase, DPP-4: dipeptidyl peptidase-4, F1,6DP: fructose 1,6-bisphosphatase, G6P: glucose 6-phosphatase, G6Pase: glucose-6-phosphatase, G6PD: glucose 6-phosphate dehydrogenase, GGT: gamma glutamyl transpeptidase, GK: glucokinase, GLUT: glucose transporter type, GPx: glutathione peroxidase, GSH: reduced glutathione, HDL: high-density lipoprotein, IFNγ: Interferon gamma, IL: interleukin, iNOS: inducible nitric oxide synthase, IR A: Insulin receptor A, LDH: lactate dehydrogenase, LDL: low-density lipoprotein, MMP: matrix metalloproteinase, NF-κB: nuclear factor κ-light-chain-enhancer of activated B cells, NO: nitric oxide, NTPDase: ectonucleoside triphosphate diphosphohydrolase-1, PKLR: pyruvate kinase, PLA: poly-lactide acid, PLGA: poly-(lactide-co-glycolide), PTP1B: protein tyrosine phosphatase 1B, PVA: polyvinyl alcohol, ROS: reactive oxygen species, SOD: superoxide dismutase, TCM: traditional Chinese medicine, TNF-α: tumour necrosis factor alpha, VLDL: very low-density lipoprotein.

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