| Category | Description | Key features | Examples | References |
|---|---|---|---|---|
| Zero Dimensional (0-D) | Have all three dimensions confined within the nanoscale range. | Exhibit pronounced quantum confinement effects and unique optical and electrical properties. | Quantum dots, nanoparticles, fullerene, etc. | 3 |
| One Dimensional (1-D) | Two dimensions are within the nanoscale range while the third dimension extends beyond the nanoscale range. | Show anistropic charge transport and mechanical strength due to their elongated structure. | nanorods, nanohorns, nanotubes, nanowires, nanofibers, etc. | 3 |
| Two Dimensional (2-D) | Only the thickness lies in the nanoscale range while the other two dimensions extend beyond the nanoscale range. | Provide large surface area and tunable electronic and catalytic properties. | nanolayers, nanosheets, nanofilms, etc. | 4, 5 |
| Three Dimensional (3-D) | Have all their dimensions outside the nanoscale range. | Offer interconnected netwoks with enhanced mechanical integrity and active surface sites. | bulk powders, arrays of nanowires, etc. | 6 |

**Table S1.** Classification of nanomaterials based on their dimensional characteristics, representative examples and unique structural features.

| Sr. No. | Factors | Influence on Nanoparticles | References |
|---|---|---|---|
| 1. | Phytochemical composition of plants | Different plants supply varying bioactive compoundssuch as phenolics, flavonoids and protein which determine the efficiency of metal-ion reduction and particle stabilization. | 3 |
| 2. | Extract concentration | Increasing the concentration of the plant extract enhances the number of capping molecules, resulting in more uniformly dispersed, smaller particles. | 1 |
| 3. | Ratio of extract to metal salt | A higher extract proportion enhances stabilization and limits particle growth whereas excess of metal salt may favor aggregation. | 1, 3 |
| 4. | pH of reaction | In general, alkaline pH speed up the reduction process while acidic pH slow down the reaction. | 1 |
| 5. | Reaction temperature | Higher temperature often produces smaller nanoparticles while lower temperatures result in larger and irregularly structured nanoparticles. | 1 |
| 6. | Incubation period | Shorter contact time produce fine, small particles while extending the incubation period may promote growth. | 1 |
| 7. | Agitation | Stirring enhance contact between reactants, resulting in uniform nucleation while poor mixing may lead to non-uniform growth and aggregation of particles. | 8 |
| 8. | Solvent | Solvent (water or aqueous extracts) polarity and ionic content influence the reaction rate and particle growth. | 57 |
| 9. | Post- synthesis treatment | Steps such as washing, centrifugation, drying and ageing affect the particle's characteristics. | 8 |
| 10. | Concentration of metal-ion precursor | Excess precursor often produces larger and less stable particles whereas dilute solutions favor smaller and more uniform nanoparticles. | 57 |

**Table S2.** Major experimental and environmental parameters influencing the green (plant-mediated) synthesis of nanoparticles, highlighting their effect on particle formation, morphology, and stability.

| S.no. | Plant | Plant Part | Precursor | Metal Nano-particles | Morphology/ Size/ Shape | Reaction Time/ T$^0$C /pH | Color Change | Application | Reference |
|---|---|---|---|---|---|---|---|---|---|
| 1. | *Cymbopogon citratus* | Leaf | $AgNO_3$ | EO-AgNPs | Spherical / 332 nm | 24 hrs. / Room temperature | Pale yellow to dark brown | Act as biopesticide to kill lichens on rock surfaces. | 75 |
| 2. | *Ricinus communis* | Leaf | $AgNO_3$ | AgNPs | Almost Spherical / 38 nm | 4 hrs./ Room Temperature | Transparent to Brown | Shows inhibitory activity against Urease and Xanthine oxisade enzymes. | 82 |
| 3. | *Atropa belladona* | Leaf | $AgNO_3$ | AgNPs | Spherical / 5-20 nm | 30 min. / 7 / 60$^0$C | Transparent to yellowish Brown | Exhibit antioxidant, anti-inflammatory, larvicidal and anticancer activity against a cervical cancer (HeLa) cell line. | 58 |
| 4. | *Artocarpus heterophylus* | Leaf | $AgNO_3$ | AgNPs | Spherical / 20-40 nm | 15 min. / 50$^0$C | Dark brown (black) to Brown | Exhibit antibacterial and antibiofilm activity. | 83,84 |
| 5. | *Azadirachta indica* | Leaf | $AgNO_3$ | AgNPs | Predominantly spherical/ 38.5 nm | 20 min./ Room Temperature | Yellowish to reddish brown | Shows dose-dependent antioxidant and anticancer properties against MCF-7 and HeLa cells. | 85 |
| 6. | *Lantana camara* | Flower | $AgNO_3$ | AgNPs | Spherical / 33±5nm | 30 min./ 22-25$^0$C | Pale yellow to red | Shows antioxidant activity against DPPH and | 86 |

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| | | | | | | | | photocatalytic properties by degrading MB. | |
| 7. | *Pistacia chinesis* | Seed | $HAuCl_4$ | AuNPs | Spherical/ 10-100 nm | 30 min./ $40^0C$ | Purple blue to ruby red | Exhibit potential for enzymatic inhibition of urease and carbonic anhydrase. | 87 |
| 8. | *Lannea discolor* | Leaf | $HAuCl_4$ | AuNFs | Protruding petal-like structure/ 30-97 nm | 1 hr./ $25^0C$ and $80^0C$ | Dark yellow to grayish | Can inhibit growth of certain bacteria. | 88 |
| | | Stem and Root | $HAuCl_4$ | AuNPs | Spherical/ 10-30 to 9.3-37.5 nm | 1 hr./ $25^0C$ and $80^0C$ | Red to intense violet | | |
| 9. | *Moringa oleifera* | Leaf | $HAuCl_4.3H_2O$ | AuNPs | Spherical, Oval and some Hexagonal/ 35-51 nm | 24 hrs./ Room temperature | Pale yellow to ruby red | Exhibit dose-dependent antioxidant, antidiabetic and anticancer properties. | 89 |
| 10. | *Gymnosporia montana* | Leaf | $HAuCl_4.3H_2O$ | AuNPs | Primarily spherical/ 10-20 nm | 30 min./ $70^0C$ | Yellow to reddish pink | Possess DNA interaction, antioxidant and cytotoxic abilities. | 90 |
| 11. | *Glycyrrhzia glabra* | Root | $HAuCl_4.3H_2O$ | AuNPs | Spherical/ 43.17 nm | 2 hrs. 30 min. /pH=5 | Yellow to dark violet | Exhibit antibacterial, antifungal, anticancer and fibrinolytic activity. | 91 |
| 12. | *Echinochloa pyramidalis* | Root | $CuSO_4.5H_2SO_4$ | CuNPs | Irregular and more porous appearance / 0.2145 nm | 4 hrs. / $60^0C$ | Brown to sea green | Used to remove 7 types of PAHs in bitumen seepage water via adsorption. | 92 |

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| | | Leaf | $CuSO_4.5H_2SO_4$ | CuNPs | Spherical and relatively even appearance / 0.1623 nm | | | | |
| | | Stem | $CuSO_4.5H_2SO_4$ | CuNPs | Irregular and more porous appearance / 0.1582 nm | | | | |
| 13. | *Jatropha curcas* | Leaf | $CuCl_2$ | CuNPs | Almost spherical / 10 ± 1 nm | 24 hrs./ Room temperature | Deep brown to yellowish brown | They possess photocatalytic activity against methylene blue. | 93 |
| 14. | *Terminalia bellirica* | Fruit | $CuSO_4.5H_2SO_4$ | UCuNPs | Spherical / 2-7 nm | Room temperature | Sky blue to carmine red | Evaluated for antimicrobialefficacy against *Candida tropicalis* and *Escherichia coli.* | 94 |
| 15. | *Cissus vitiginea* | Leaf | $CuSO_4$ | CuNPs | Spherical / 10-20 nm | 24 hrs. / Room temperature | Blue to brown | Demonstrateantibacterial effects against UTI-causing pathogens. | 95 |
| 16. | Soybean (Glycine Max) | Leaf | $PdCl_2$ | PdNPs | Spherical/ 15 nm | 48 hrs. | Transparent orange to dark brown | They are applied in Suzuki coupling reactions due to their catalytic efficiency. | 96 |
| 17. | *Peganum harmala* | Seed | $Pd(CH_3C00)_2$ | PdNPs | Spherical/ 22.5 ± 5.7 nm | 24 hrs. / $60^0C$ | Yellow to brown | Exhibits inhibitory effects on cysteine and proteinase. | 97 |
| 18. | *Pistacia atlantica* | Fruit | $PdCl_2$ | PdNPs | Spherical / 10 nm | 5 min. / $85^0C$ | Transparent yellowish | Exhibit catalytic activity in organic transformations, | 98 |

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| | | | | | | | to dark brown | including Suzuki-Miyaura coupling and Mizoroki-Heck coupling reactions. | |
| 19. | Allium fistulosum | Leaf | $Pd(CH_3C00)_2$ | PdNPs | Spherical / 500 nm | $60^0C$ | Mild brown to dark brown | Shows antibacterial, antifungal, antioxidant, antidiabetic and photocatalytic behavior. | 99 |
| 20. | *Basella alba* | Leaf | $Pd(CH_3C00)_2$ | PdNPs | Spherical / 2 micro-m | $60^0C$ | Pale brown to green | | |
| 21. | *Tabernaemontana divaricate* | Leaf | $Pd(CH_3C00)_2$ | PdNPs | Spherical / 2 micro-m | $60^0C$ | Mild brown to dark brown | | |
| 22. | *Peganum harmala* | Seed | $Pd(CH_3C00)_2$ and $PtCl_4$ | Pt-PdNPs | Spherical/ 33.5 ± 54 nm | 24 hrs. / $60^0C$ | Pale yellow to dark brown | Shows much more antioxidant and anticancer activity against MCF7 and A549 cell lines than the individual PtNPs and PdNPs. | 97 |
| 23. | *Peganum harmala* | Seed | $PtCl_4$ | PtNPs | Spherical/ 20.3 ± 1.9 nm | 24 hrs. / $60^0C$ | Yellow to black | Shows cytotoxicity against MCF7 as well as A549 cells via apoptosis and cell cycle arrest. | 97 |
| 24. | *Atriplex halimus* | Leaf | $H_2PtCl_6.6H_2O$ | PtNPs | Spherical/ 1-3 nm | 1 hr. / $95^0C$ / pH=9.6 | Dark yellow to black | Exhibit antibacterial activity, catalytic degradation and | 100 |

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| | | | | | | | | antioxidant properties. | |
| 25. | *Xanthium strumarium* | Leaf | $H_2PtCl_6.6H_2O$ | PtNPs | Rectangular/ 20 nm | 1 hr. / $100^0C$ | Pale yellow to dark brown | Exhibits anticancer, antibacterial and antifungal activity. | 101 |
| 26. | Cordyceps | Flower | $H_2PtCl_6.6H_2O$ | PtNPs | Spherical/ 13.34 ± 4.06 nm | 1 hr. / $50^0C$ / pH=10.0 | Pale yellow to dark brown | Exhibits dose-dependent antioxidant potential and demonstrates antibacterial efficacy. | 102 |
| 27. | *Camellia sinensis* | Leaves | Ferrous sulphate | FeNps | Spherical/ 20-30 nm | $700^0C$ | Black color precipitate was formed | Heterogeneous catalyst for transesterification of algae oil into biodiesel; achieved yield of 93.33%. | 103 |
| 28. | *Azadirachta indica* | Leaf | $AgNO_3$ | AgNPs | Not reported | Not reported | Not reported | Served as efficient nanocatalysts for biodiesel production | 104 |

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| | | | | | | | | from waste vegetable oil, yielding 72.9% | |
| 29. | *Nymphaea tetragona* | Flower | $H_2PtCl_6$ | PtNPs | Spherical/ 4.04 ± 1.31 nm using and N. tetragona extracts in a 1:1 ratio, and 2.21 ± 0.80 nm with a 1:4 ratio | 1 hr. and 30 min. | Pale yellow to brown/ black | Exhibits skin lightening and antiageing properties by suppressing tyrosinase enzyme activity and enhancing collagen-I synthesis. | 105 |

**Table S3** represents various studies on plant mediated synthesis of metal-based nanoparticles, showcasing how different plant extracts and reaction parameters influence their morphology, stability and diverse applications.

| S. No. | Plant | Plant Part | Precursor | Metal Oxide Nano-particles | Morphology/ Size/ Shape | Reaction Time/ $T^0C$ /pH | Color Change | Application | Reference |
|---|---|---|---|---|---|---|---|---|---|
| 1. | *Eucalyptus globulus* | Leaf | Anhydrous Copper Sulfate | CuO NPs | Spherical / 88 nm | 2 hrs. / Room temperature | Solution changed to brown color | Can be utilized for the removal of methyl orange from aquatic environments. | 150 |
| 2. | *Parthenium hysterophorus* | Whole plant | Copper (II) Sulfate | CuO NPs | Spherical / 59.99 nm | Not reported | Solution changed to brown color | To degrade antibiotics like Rifampicin from water bodies. | 151 |

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| 3. | *Morinda citrifolia* | Leaf | $CuSO_4.5H_2O$ | CuO NPs | Sphere-like/ 20-50 nm | 5 hrs./ $70^0$C/ 7 | Pale green to deep brown | Exhibits antimicrobial potential. | 152 |
| 4. | *Ocimum lamiifolium* | Leaf | $CuNO_3.3H_2O$ | CuO NPs | Spherical / 15.09 nm | 24 hrs. / room temperature | Color changed to greenish brown | Shows antibacterial potential. | 153 |
| 5. | *Withana somnifera* | Leaf | $CuNO_3.3H_2O$ | CuO NPs | Spherical with rough appearance/ 19.14 nm | | | | |
| 6. | *Dalbergia sisso* | Leaf | $CuSO_4.5H_2O$ | CuO NPs | Agglomerated large clusters with a few spherical particles / avg. diameter of <100 nm | 7 hrs. / $130^0$C | A solid black product was obtained | Shows antibacterial activity, reduce the formation of biofilm and display dose-dependent antioxidant activity. | 154 |
| 7. | *Azadirachta indica* | Aerial part | $CuSO_4.5H_2O$ | CuO NPs | Semispherical / 27.4 nm | Not reported | Pale blue to green to dark brown | NPs possess antibacterial, antibiofilm, | 52 |

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| 8. | *Simmondsia chinesis* | Aerial part | $CuSO_4.5H_2O$ | CuO NPs | Semispherical / 25.3 nm | | | antioxidant and anticancer activity.. | |
| 9. | *Clematis orientalis* | Leaf | $Cu(OAc)_2$ | CuO NPs | Spherical to irregular planar shaped/ 44 nm(0.5 M) and agglomerated with interlinking voids and pores/ 34 nm (0.25 M) | 2 hrs./ $50^0C$ | Greenish brown to mustard green to black | Exhibit moderate antioxidant activity and potent antimicrobial activity against *K. pneumonia* and *S. aureus.* | 79 |
| 10. | *Madhuca indica* | Leaf | $FeSO_4$ | FeO NPS | spherical/ 50-60 nm | 24 hrs./ $37^0C$ | Yellowish to dark brown | NPs showed dose-dependent antioxidant activity, anti-inflammatory and antidiabetic properties. | 155 |
| 11. | *Hibiscus rosa chinesis* | Flower | $FeCl_2.4H_2O$ | $Fe_2O_3$ NPs | Mostly Spherical/ 51 nm | Heated for 20 sec./ 7 | Yellow to dark brown | Exhibit antibacterialproperties. | 156 |
| 12. | *Bauhinia tomentosa* | Leaf | $FeCl_3$ | $Fe_2O_3$ NPs | Face-centered cubic/ 70 nm | Not reported | Orangish brown to black | Used in the synthesis of 1,3 diolein. | 157 |

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| 13. | *Camellia sinesis* | Leaf | Ferrous sulfate solution | Iron oxide NPs | Spherical/ 20 nm | $700^0$C | A black colored precipitate was obtained | Used as a heterogeneous catalyst in the Biodiesel production from *Azolla filiculoides* . | 158 |
| 14. | *Carica papaya* | Leaf | $FeCl_3.6H_20$ | $Fe_2O_3$ NPs | Non uniform and agglomerated/ 21.59 nm | 3O min. / room temperature / 11 | Solution changed to intense black color | NPs showed photocatalytic activity for remazol yellow RR dye, cytotoxicity towards BHK-21 as well as HeLa cell lines and found to be antibacterial. | 159 |
| 15. | *Psidium guajava* | Leaf | $FeCl_2.4H_20$ and $FeCl_3.6H_20$ | IONPs | Cubic and partly spherical / 12.64 nm | 30 min./ Room temperature / 11 | Transparent yellow to black | They possess dye degradation activity for methylene blue and methylene orange, antibacterial effectiveness and | 160 |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | antifungal activity. . | |
| 16. | *Salvadora persica* | Bark | $FeSO_4.7H_2O$ | $Fe_2O_3$ NPs | Spherical / 15-20 nm | 2 hrs./ $70^0$C/ 11 | A black precipitate was observed | NPs show super-magnetic property and no toxicity for HT-29 cell lines. | 161 |
| 17. | *Mangifera indica* | Seed | Zinc nitrate solution | ZnO NPs | Spherical, cylindrical, rectangle and triangle/ 40-70 nm | 15 hrs. / $30^0$C | White to dark brown | Exhibit strong bacteriostatic efficacy for *Bacillus subtilis and Escherichia coli* as well as antioxidant properties. | 162 |
| 18. | *Aquilegia pubiflora* | Leaf | Zinc acetate dehydrate salt | ZnO NPs | Spherical structure / 131 nm | 2 hrs./ $60^0$C/ 7 | Not reported | NPs exhibited toxicity against HepG2 cell line, antidiabetic properties, anti-Alzheimer’s activity, antiaging and | 163 |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | antiflammatory properties. | |
| 19. | *Amygdalus scoparia* | Stem bark | Zinc acetate dehydrate solution | ZnO NPs | Spherical/ 15-40 nm | 4 hrs. / $80^0$C | A pale pink color was observed | Shows antimicrobial activity , cytotoxicity against LS180, HeLa and MCF7 cells and antidiabetic activity. | 164 |
| 20. | *Berberis aristata* | Leaf | Zinc acetate dehydrate solution | ZnO NPs | Needle-like/ 20-40 nm | $70^0$C | A deep yellow colored precipitate was observed | Demonstrate antimicrobial effectiveness against multiple strains of gram-negative and gram-positive bacteria and antioxidant properties. | 165 |
| 21. | *Myristica fragrans* | Fruit | $Zn(NO_3)_2.2H_2O$ | ZnO NPs | Spherical or elliptical / 41.23 nm | 2 hrs./ $60^0$C | Light brown to dark grey | NPs were found to be antibacterial, inhibitory for kinase, alpha amylase and alpha glucosidase | 166 |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | enzymes, antioxidant, antilarvicidal, antileishmanial and biocompatible. | |
| 22. | *Plaintain* | Peel | $ZnC_4H_60_4$ | ZnO NPs | Spherical/12.45 nm | 2 hrs. / $85^0C$/ 12 | An off-white precipitate was obtained | NPs were found to be antimicrobial for various tested pathogens. | 65 |
| 23. | *Raphanus sativus* | Leaf | $Zn(0_2CCH_3)_2(H_2O)_2$ | ZnO NPs | Spherical hexagonal/ 66.47 nm | 3 hrs. / $80^0C$ / 10 | Yellow to pale | Displayed antimicrobial properties and , Cytotoxic effects on the MCF7 cell line. | 66 |
| 24. | *Commelina benghanlensis* | Whole plant | $TiF_4$ | $TiO_2$ NPs | Rough Spherical/ 200 nm (10g $TiO_2$) and smooth spherical (30g $TiO_2$) | 2 hrs. / $90^0C$ | A yellow greenish solution was obtained | Exhibit photocatalytic activity for MB dye and SSX with 65% and 82% degradation, respectively. | 167 |

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|---|---|---|---|---|---|---|---|---|---|
| 25. | *Tulbhagia violacea* | Leaf | $Ti(C_4H_90)_4$ | $TiO_2$ NPs | Agglomerated rectangular (10 ml and 40 ml of leaf extract) and slightly agglomerated spherical (20 ml of leaf extract) | 4 hrs. / room temperature | White to creamy yellow or orange | The NPs were antioxidant and anticancerous for HeLa and HEK 293 cell lines. | 168 |
| 26. | Alcea | Whole plant | $C_{12}H_{28}O_4Ti$ | $TiO_2$ NPs | Irregular and agglomrerated/5-33 nm | 4 hrs. / $50^0C$ | Not reported | The NPs exhibited photocatalytic activity. | 169 |
| 27. | Thyme | Whole plant | $C_{12}H_{28}O_4Ti$ | $TiO_2$ NPs | Polyhedron / 3-27 nm | | | | |
| 28. | *Caricaceae* | Shell | Titanium iso-propoxide | $TiO_2$ NPs | Semispherical with some monoclinic spherical / 15 nm | 5 hrs. / $85^0C$ / 11 | Greenish brown to pale blue | Exhibits antifungal properties, as well as has a positive effect on plant growth. | 170 |
| 29. | *Withania somnifera* | Root | Titanium (IV) Oxide | $TiO_2$ NPs | Aggregated spherical and square shapes/ 50-90 nm | 3 hrs. / $70^0C$ | Whitish to light green | Exhibits dose-dependent antibiofilm activity and anticancer activity for | 171 |

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | HepG2 cell line. | |
| 30. | *Cassia fistula* | Leaf | $TiO_2$ | $TiO_2$ NPs | Spherical | 24 hrs. | Pale yellow to pure white milky color | The NPs were antibacterial against *Escherichia coli* and *Staphylococcus aureus.* | 172 |
| 31. | *Solanum surattense* | Whole plant | TiO $(0H)_2$ | $TiO_2$ NPs | Clustered Spherical/ 10-80 nm | 24 hrs. / Room temperature | Light green to whitish brown | Exhibited dose-dependent antiepileptic properties and cytotoxic properties for THP-1 cells. | 173 |
| 32. | *Melia azedarach* | Seed | Magnesium nitrate | MgO NPs | Spherical/ various diameter of 73.29 nm for 5 ml, 62.4 nm for 10 ml and 44.29 nm for 20 ml of seed extract, respectively | 4 hrs. /$90^0$C/ 8 | White precipitate was obtained | NPs has excellent potential as larvicidal and antioxidant agents. | 174 |

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|---|---|---|---|---|---|---|---|---|---|
| 33. | *Rosa floribunda charisma* | Flower | $Mg(N0_3)_2.6H_2O$ | MgO NPs | Polyhedral/ 35.25-55.14 nm | 6 hrs. /$90^0C$ | A pink color was developed | The NPs exhibited dose-dependent antioxidant, antiaging and antibiofilm activity. | 175 |
| 34. | *Mangifera indica* | Leaf | Magnesium sulfate | MgO NPs | Irregular flake-shaped / 10.25 nm | 30 min. /$100^0C$ | Green to brown | Nps derived from *Carica* and *A. indica* leaf extracts had better antibacterial properties. | 176 |
| 35. | *Azadirachta indica* | Leaf | Magnesium sulfate | MgO NPs | Irregular fused-shaped / 27.08 nm | | | | |
| 36. | *Carica papaya* | Leaf | Magnesium sulfate | MgO NPs | Spherical / 20.82 nm | | | | |
| 37. | *Hagenia abyssinica* | Female flower | $Mg(N0_3)_2.6H_2O$ | MgO NPs | Spherical / 10-40 nm | 120 min. /$60^0C$/ 12 | A muddy brown color appeared | The NPs exhibited antibacterial activity. | 67 |
| 38. | *Psidium guajava* | Leaf | $Mg(N0_3)_2.6H_2O$ | MgO NPs | Uniform spherical / 85.8 nm | 3 hrs. | A brownish yellow solution was formed | The NPs showed antilarvicidal and antibacterial activity. | 177 |

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| 39. | *Moringa oleifera* | Leaf | $MgCl_2$ | MgO NPs | Face- centered cubic sructure | 6 hrs. / room temperature | Transparent solution turned yellowish | NPs are utilized in the fields of super-conductor, opto-electronic devices and energy storage applications. | 178 |
| 40. | Aubergine | Waste fruit part | $[Cr(NO_3)_3 \cdot 9H_2O]$ | $Cr_2O_3$ NPs | Agglomerated and irregular | 2 hrs./ 60°C | Green color was obtained | Used as a heterogeneous catalyst for biodiesel production from non edible oil seeds (*Phyllanthus maderaspatensis*); achieved 92% conversion. | 179 |
| 41. | *Azadirachta indica* | Leaf | CuO NPs | $Cu(NO_3)_2$ or $CuSO_4$ | Not reported | Not reported | Not reported | Used as a heterogeneous nanocatalyst for biodiesel production from waste | 104 |

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| | | | | | | | | vegetable oil, achieving yield of 64.6%. | |
| 42. | *Hyphaene thebaica* | Fruit | $Mg(N0_3)_2.6H_2O$ | MgO NPs | Spherical / 20-60 nm | Overnight | Darkish yellow to light yellow | The NPs exhibited photo-catalytic activity with MB degradation efficiency of 98% in 110 min. | 180 |

**Table S4** highlights representative reports on the biosynthesis of metal-oxide nanoparticles, emphasizing the role of plant derived phytochemicals in determining their structural features and functional performances.