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Research Article

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Biomimetic Synthesis of Silver Nanoparticles for Breast Cancer Therapeutics and Its Mechanism

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Abstract

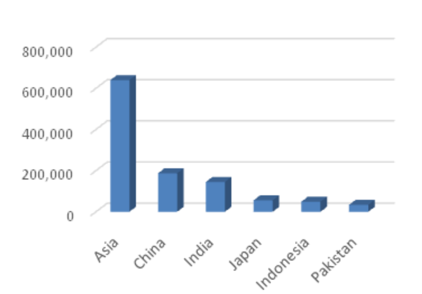
Scientists are investigating to find new strategies in the field of nanotechnology for the cure and diagnosis of breast cancer as it is considered as real medical issue for women. Women carrying a pathogenic germline transmutation in BRCA1/2 and has hazard of causing breast cancer because of its high lifetimeand extensive amount of cancer with BRCA1 transmutation which is related with the TNBC phenotype. Nanotechnology is an emerging field which makes best utilization of idle metals like silver, gold, and platinum to combine metallic nanoparticles. Synthesis of nanoparticles using biological system have several benefits over synthetic andphysical synthesis (nontoxic, not expensive, eco-friendly and less energy is require). Use of medicinal plants in the field of nanotechnology is fascinating many more researchers towards the biological synthesis of metallic nanoparticles. Such plants can be considered as the best source of diverse phytochemicals for the synthesis of bio-conjugative silver nanoparticles (AgNPs). In this review, we discuss the synthesis of AgNPs from plant extracts and their proposed mechanism of action on breast cancer cell lines. Moreover, we have thoroughly discussedits cases and achievements accomplishedby the use of biogenic AgNPs as cancer therapeutics agents. It is concluded that biogenic AgNPs can become a potential cancer therapeutics agent in the future.

Keywords: Medicinal plants, Biological synthesis, Breast cancer, Silver nanoparticles.

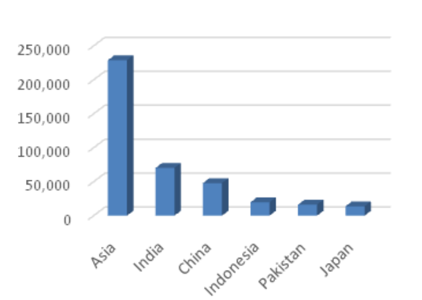
Introduction

Malignancy is a noteworthy general medical problem in around the biosphere. Breast cancer is the second recordregular reason for disease demise in ladies, which remains a general medical problem on a worldwide scale. Mammography and ultrasonography are still the best for ladies with thick and non-thick breast tissues. X-ray, lymphatic diagramming, areola saving mastectomy, fractional breast particle emission, neo-adjuvant complete treatment and medicationsstand promising for subgroups of breast-cancer patient [1,2]. Breast-monitoring surgery took after through postoperative entire breast exterior beam radio-therapy is currently the regular of tend to appropriate patientwith premature breast cancer. Exterior beam radiotherapy is a sheltered and viable treatment; the risks are low, but subsequently breast cancer is communal, without a doubt quantity of ladies with problems and reactions remains extensive. Many kinds of cancers at first react to chemotherapy, however later become resistant [3,4]. The accessible chemo preventives and chemotherapeutic specialistscause undesirable reactions [5,6] in this manner building up a biocompatible and worthwhilestrategy of cure for cancer is necessary. Cytotoxic operators utilized for its cure are costly and known to initiate a few reactions, for example anemia and particular in the era of cell resistance.It is imperative to discover elective treatments or medications to beat these downsides. Women conveying a pathogenic germline transmutation in BRCA1/2 have hazard of creatingbreast cancer as a result of its high lifetime. In women an extensive amount of cancer with BRCA1 transmutation are related with the TNBC phenotype. The test depends on family history of patient, infection timeand pathologic factors of breast cancers. Researched comes about demonstrated that, 523 Pakistani women were determined to have primary invasive breast cancer patients containing 237 analyzed less than 30 years old and 286 with a family history were chosen for BRCA1/2 little assortment of transmutation and extensivegenomealteration.Immunohistochemicallyinvestigation of estrogen or progesterone receptor and human epidermal growth factor receptor 2 (ER,PR,HER2) appearancedemonstrated that 36.7 % patients have tumor with BRCA1 transmutations related with TNBC [7]. BRCA1 transmutations with TNBC were more regular in patients than with non-TNBC. Women with TNBC were detected to have more noteworthy inclination for obtrusive ductal carcinoma when contrasted with non-TNBC patients.Pakistani women had a before time of determination with TNBC and with higher review tumors than non-TNBC [8]. Breast cancer is the fifth driving reason for cancer death since it is one the most well-known cancers in Asia. In more established countries its frequency is exceptionally higher that is the reason its death rate is higher in less established ones.

Breast cancer is proposed as real medical issue for women in Asia. In 2012, 639,824 instances of breast cancer were recorded in Asian nations. Five Asian nations with the most astounding number of cases were accounted for which incorporates China, India, Japan, Indonesia and Pakistan. Which incorporate 470,896 cases in these five Asian nations and (59.7%) of the cases in all over Asia appearing in graph (A). Because of breast cancer 228,926 deaths were happened and the most noteworthy number of deaths was seen in five chosen Asian nations. Aggregate of 167,985 cases (73.4%) of the deaths happened in these five chose nations appearing in graph (B) [9].



Graph (A)



Graph (B)

Figure: (A) Showing the most noteworthy number of breast cancer instances was accounted and (B) Showing the most astounding number of deaths happened because of breast cancer in these five Asian nations.

Biologically synthesis isgreat approach to diminish the utilization or era of perilous substances to human wellbeing and to the earth. Nanotechnology is a favorable field particularly for biodiversity amusing Asian countries. From antiquated time plants are utilized for various diseases to cure. Asia is known as biggest professional flowerbed of the world for the production of variousrestorative plants. Add up to 70% populace of plants in Asia depends on therapeutic plants. It is developed for religious and restorative purposes and for its basic oil [10]. Nano-biotechnology is the filed that applies the nanoscale rule and techniques to methods to change bio-frameworks (living and non-living) and uses natural standards and materials to make new gadgets and frameworks coordinated from the nanoscale. Nanomedicine is a rapidly creating and promising field that makes best utilization of idle metals like silver, gold, and platinum to combine metallic nanoparticles with high helpful potential for different biomedical applications [11]. Nanotechnology has contributed in numerous applications, such as therapeutics, biomedicine because of its prepared assembling process, quality control, and biocompatibility, and to be sure its utilization in wound mending and antibacterial applications are as of now a portion of clinical practice. Some cytotoxic specialists have been utilized as a part of the treatment of breast cancer, for example, doxorubicin, cisplatin, and bleomycin, giving useful impacts, however the efficacy and bad marks are indistinct, in this manner it is important to discover novel restorative operators against cancer that are biocompatible and cost-effective [12-14]. Nanoparticles are being effectively produced for tumor imaging in vivo, bio-molecular profiling of cancer biomarkers, and targeted drug delivery. These nanotechnology based methods can be applied broadly in the administration of different threatening infections. Some breast cancers express protein biomarkers (e.g., estrogen receptor, progesterone receptor, and ERBB2) on which remedial choices are made. AgNPs have been appeared to initiate the apoptotic pathway in vitro through free oxygen radical era, which indicated antitumor, anti-proliferative, and anti angiogenicinfluence in vitro [15]. AgNPs are gaining much attention among the rising nano items in the field of nano- medication because of their novel properties and evidentrestorative potential in treating an assortment of ailments, including retinal neovascularization [16]. Nanotechnology is an developing technology whichinclude numerous territories like chemist, cosmetics, and mechanical advances and are notable to have critical applications in the fields of electronic, magnetic, optoelectronics, and information storage [17] and numerous especially in the area of pharmaceutical and medicinal analytic, which additionally assume key part in environmental protection and vitality conversion. Various methodologies for the synthesis of silver NPs are accessible, For instance, silver particles are decreased by chemical electrochemical, radiation, photochemical strategies, Langmuir–Blodgett and biological methods [18-24].

Methods of silver NPs synthesis

Physical synthesis

Physical synthesis of silver NPs have a few disadvantages like it might involve huge space, expends an extraordinary measure of vitality while raising the ecological temperature around the source material, requires a great deal of time to accomplishthermal stability, devourmore power than a few kilowatts and a preheating time of a few several minutes to achieve a stable working temperature [25-27]. These strategies are exceptionally costly it might deliver concentrated slime and high cost of power is required (Figure 1) [28].

Chemical synthesis

The production of sludge, which contains the concentrated polluting influences, still requires disposal. Corrosive, coordinate, vat, stringent and responsivedyes typically coagulate, yet the subsequent floc is of low quality and does not settle well, yielding unremarkable outcomes which arehazardousto all living and environment and these techniques are additionally cost-effective [29]. Some Chemical synthesis techniques have short half-life, normally being 20 min. This time can be further abbreviated if dyes are available, with stability being influenced by the nearness of salts, pH, and temperature (Figure 1 [30].

Biological synthesis

Biological approachesfor nanoparticles are ecological agreeable this approach is likewise called "Green synthesis" it is non-toxic and safe reagents and it is not unsafe or perilous to any living beings. These approaches are not costly and high cost of power is likewise not required.These approachesdon't deliver any polluting influences to environment. Biological approaches additionally decrease the cost of energy and other option to synthetic and physical approaches [31]. In this way, green synthesis utilizing organic particles got from plant sources as concentrates displaying prevalence over synthetic methods. The synthesis and gathering of metallic nanoparticles would profit by the improvement of clean, nontoxic and environmentally adequate ‘‘green chemistry’’ methodology, likely including life forms going from microscopic organisms to parasites and even plants.Chemical and Physical approaches have been utilizing high radiation and extremely concentrated reductants and stabilizing agents that are destructive for the environmental and to human wellbeing. Consequently, biological synthesis of nanoparticles is a solitarystride bio-reduction technique and less energy isutilized to synthesis (Figure 1) [32].

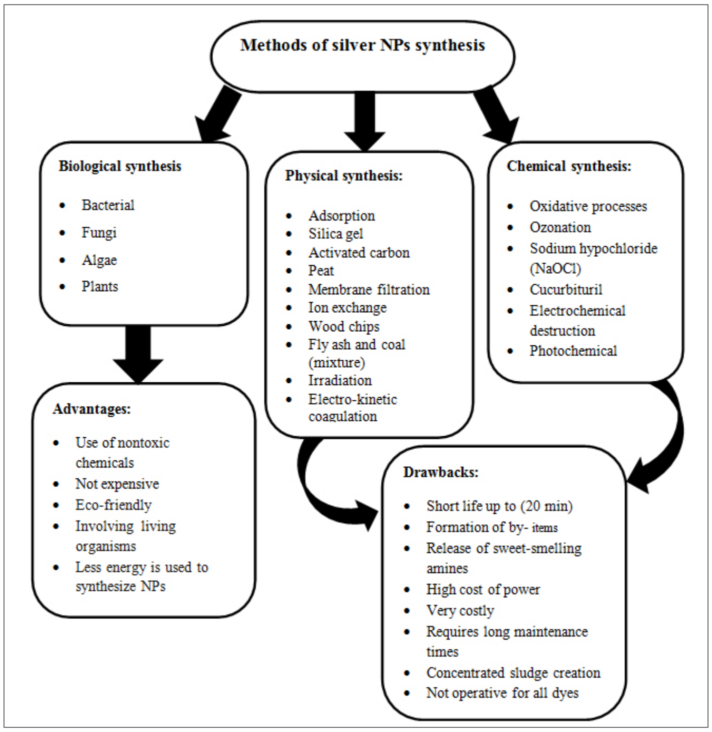


Figure 1: Different methods of silver nanoparticles and its advantages and drawbacks [33].

Between various metals nanoparticles silver have received more attraction because it is effective antimicrobial agent, which contain low toxicity. Silver nanoparticles also have a diverse effect in in-vitro and in-vivo applications. Silver nanoparticle synthesis is on top of attention because of its simplicity, characteristics, easy process and eco-friendly. Silver nanoparticles are of most interest for researcher because they do not affect living cells [34]. Silver nanoparticles (AgNPs) have turned out to be progressively well known as an antibiotic agent in fabrics and wound dressings, therapeuticgadgets, and apparatuses, for example refrigerators and clothes washers [35]. AgNPs have been utilized for antimicrobial, antifungal, antioxidant, and anti-inflammatory effects [36]. Nanoparticles are accounted for with a most extreme size 100 nanometer and display numerous extraordinary properties. Distinctive size, shapes and surface structure assume a part in physical and chemical electronic properties in monitoring nanomaterials. Nanotechnology is around 1 to 100nm incorporating nano-scale science, engineering and nanotechnology include imaging. Measuring, modeling and controlling matter at this length scale [16].

Bottom up and Top down

Generally there are two methodologies which are included in the syntheses of silver nanoparticles, either from ‘‘bottom up’’ method or a ‘‘top down’’ method. In bottom up method, nanoparticles can be integrated utilizing substance and biological approaches by independent-assemble of atoms to new nuclei whichdevelop into a particle of nanoscale.In top downmethodnanoparticles are normally synthesized by evaporation and condensation and bulk material breakdown into fine particles by size reduction with various lithographic techniques e.g. grinding and milling. One of the majorbenefits of this technique is that an expansive amount of nanoparticles can be synthesized in a short span of time and one of the major limitations in this procedure is during this type of syntheses; chemicals utilized are harmful and prompted to non-ecofriendly by-items..The advancement of green syntheses over chemical and physical methods is environmentfriendly, cost effective and easily scaled up for large scale syntheses of nanoparticles(Figure 2) [37].

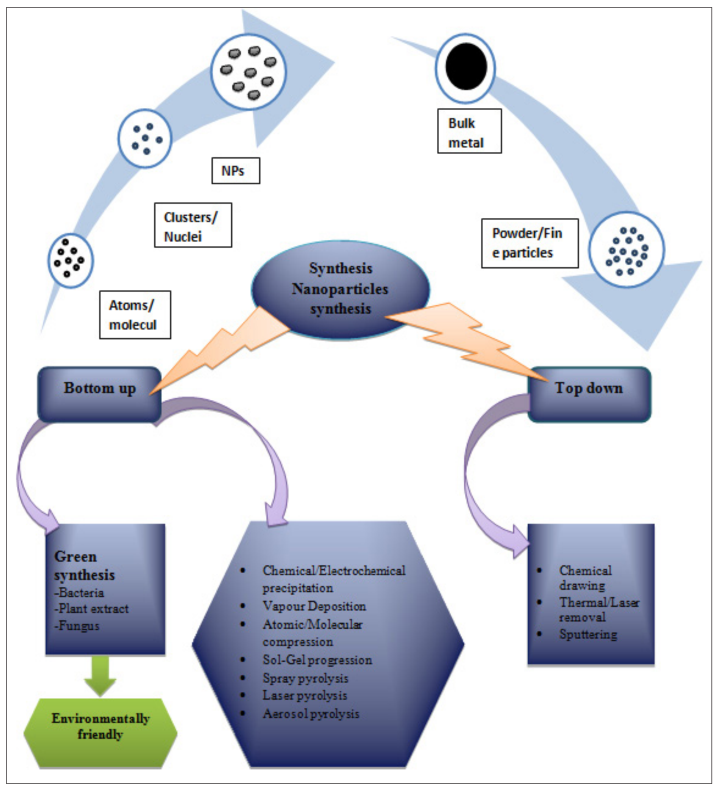


Figure 2: Different approaches of silver nanoparticles synthesis bottom up and top down, Modified from [37]

Synthesis of silver nanoparticles

Silver nanoparticles were set up by utilizing plant extract. A healthy plant/plant part taken and afterward wash that a portion of plant twice thrice with refined water and shade dry it for 5-10 days. At that point by utilizing local blender smash that dried plant part and make fine powder of it [16]. Add plant sample in a flask containing distilled water and put on hot plate and bubble for 15–20 min till shade of the dissolvable changes. Chilled off the extract at room temperature and tenderly squeezed and filtered through clean quiet fabric and through filter paper (Figure 3).

Add some of filtered extract into flask and include solution of AgNO3 to a similar. Placed extract at room temperature for 30-40 min or until the shade of solutions changes from light yellow to cocoa[38]. Centrifuged the solution twice thrice and collect the pallet after discarding the supernatant and washing with distilled water. Dry collected silver NP's on a glass plate [39,40]. Decide AgNPs by FTIR study for the characterization of the synthesized nanoparticles. Nanoparticles are generally characterized by their dimensions, figure, surface range, and disparity [41].

The common methods of characterizing nanoparticles incorporates, UV–visible spectrophotometry on which screen the creation of the silver NPs , Size, morphology and structure of NPs were studied by scanning electron microscopy (SEM), transmission electron microscopy (TEM), and Fourier transform infrared spectroscopy (FTIR), and powder X-ray diffraction (XRD), The anti-bacterial movement of silver NPs were surveyed by assurance of their of their minimum inhibitory concentrations (MIC) against the Gram positive (Staphylococcus aureus and Staphylococcus epidermidis) and Gram-negative (Escherichia coli andPseudomonas aeruginosa) microbes[42-44].

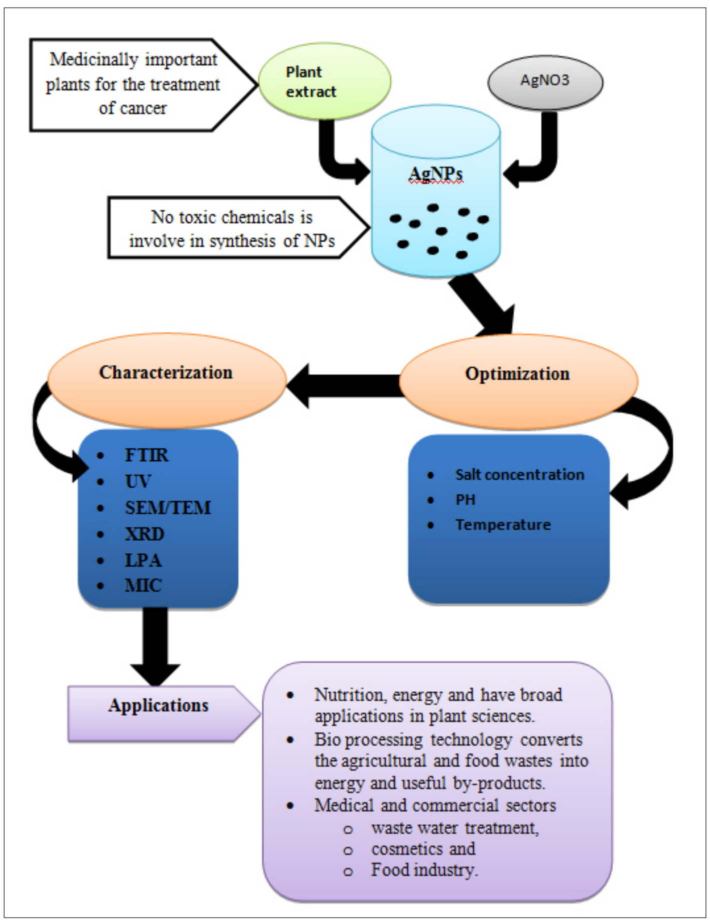


Figure 3: Full scheme of biogenic silver nanoparticles synthesis, optimization, characterization and applications.

Mechanisms and actions of Silver nanoparticles against breast cancer

1) Cell Lines

Cancer cell lines have been broadlyutilized for research purposes and ended up being a valuable tool in the hereditary approach. Its characterization demonstrates that they are an outstanding model for the investigation of the biological mechanisms involved in cancer(Bensaude-Vincent and Hessenbruch 2004). The basic part of cancer cell lines in biomedical research has a civil argument among established researchers, on the reality whether they are, or not illustrative of the first tumor (Jones 2009; Mahmoudi et al. 2011). A few authors concur that there is a high however not impeccable genomic comparability between the first tumor and the determined cancer cell line (Mahmoudi et al. 2011; Mazzola 2003). A breast primary tumor and a cell line initiated from that tumor were thought about by Tomlinson and associates in 1998. These authors announceda similar BRCA1transmutation and an indistinguishableexample of allelic misfortune in variousloci, showing that the cell line saves various qualities of the first tumor (Mahmoudi et al. 2011).

2) Biogenic AgNPs as anticancer agents

Nanoparticles could have numerous effects on cells that range from co-operations with cell membranes and cellular take-up, signaling corridors, ROS creation to gene regulation, cell cycle dysregulation and finally apoptosis or necrosis (Jones and Grainger 2009). Observing the cell cycle changes is an essential record of both the cytotoxicity of the nanoparticle. The effectiveness in the event of focusing on a dysregulated cell is the point of the review. Nanoparticles have been broadly utilized as vehicles for medication conveying to cancer cells(Chaudhuri et al. 2009; Chekhun et al. 2009). Conventional chemotherapies can be dangerous, however the ebb and flow look into advances advances in nanotechnology empowers the plan and making of nanoparticles that conveymedications to tumor locations and discharge them in situ in a controlled style. Multifunctional nanoparticles with deliberately controlled science, measure, surface charge, and additional properties can conveymedications and give them capacities, giving a more secure and more successful treatment than ordinary chemotherapy (Santos and Hirvonen 2012; Sarparanta et al. 2012).Silver nanoparticles have gotten more fascination since it is powerful antimicrobial agent, which contain low harmfulness and furthermore have an assorted impact in *in-vitro* and *in-vivo* applications. Silver nanoparticle (AgNPs) synthesis is exceptionally straightforward, simple and eco-friendly method. Silver nanoparticles have turned out to be progressively prominent as an anti-toxinoperator in wound dressings, medical gadgets, and apparatuses(Chen and Schluesener 2008). It has been utilized for antimicrobial, antifungal, cancer prevention agent and anti-inflammatory effects(Tian et al. 2007).

a) ROS production and cancer cell killing

The colloidal silver treatment expanded superoxide dismutase movement contrasted and untreated MCF-7 and PBMC.This brings about redox unevenness, essentially expanding the SOD movement in light of the generation of elevated amounts of ROI particles. Death cell can likewise be created by ROI (Reactive Oxygen Intermediates) and RNI (Reactive Nitrogen Intermediate) metabolites. The absence of movement of catalase and glutathione peroxidase may permit the poisonousimpact of hydrogen peroxide (H_2O_2) prompting to cell death(Kim et al. 2007). MCF-7 breast cancer cells treated with colloidal silver, significantly reduced the dehydrogenase actionbringing about diminished NADH/NAD+, which thusly actuates cell demise because of diminished mitochondrial film potential.Cells can suffer from DNAharm or start an apoptotic/necrotic cell demise pathway. The reason for apoptosis in AgNP treated cells is the era of reactive oxygen species (ROS) and it cause irreversible DNAharm(Moustafa et al. 2004; Simon et al. 2000). AgNPs encourage apoptosis by going about as intrinsic stimuli because of their capacity to create ROS and cause DNAtwofold strand breaks (DSBs) (Foldbjerg et al. 2009; Thubagere and Reinhard 2010).

b) Apoptosis and caspas 3 and 9 activating

Apoptosis is the proposedtype of cell demisebecause of unmistakable cell shrinkage and a morphological normal of apoptotic cells (Gerschenson and Rotello 1992). The harmful impact of hydrogen peroxide (H_2O_2) because of absence of action of catalase and glutathione peroxidase may permit prompting to cell death (Kim et al. 2007). The H_2O_2 makes cancer cells experience apoptosis and necrosis. Normal cells are impressively less helpless against H_2O_2yet expanded affectability of tumor cells to H_2O_2 is not clear it might be because of lower antioxidant resistances. A lower ability to abolish H_2O_2 by catalase, per-oxiredoxins, and GSH peroxidases may make tumor cells develop all the more quicklybecause of low concentrations of H_2O_2 than ordinary cells. H_2O_2 exerts dose-dependent impacts on cell work, from development incitement to developmentcapture, apoptosis, and finally necrosis as H_2O_2 concentrations rise.Silver colloidal induced dose-dependent cell demise in MCF-7 breast cancer cell line through apoptosis, without influencing the feasibility of typical PBMC control cells. Cancer cells expanded the rate of glycolysis in the metabolic pathway lactate dehydrogenase is included in catalyzing the change of pyruvate into lactate, which expends NADH and recovers NAD (Hugo et al. 1992). Apoptosis is a very controlled cellular procedure and assumes a critical part in managing tissue homeostasis and controlling physiological development (Alenzi 2004; Jacobson et al. 1997). Apoptosis can arise from anassortment of fortifying operators, which are by and large assembled into two classifications: extrinsic or intrinsic.Extrinsic stimuli are those that cause cell death indicating from death receptor ligation. After ligation, cytoplasmic signaling pathways are actuated, and apoptosis is activated. Intrinsic apoptosis is normally prompted through era of metabolic or genotoxicstretch. One of the bestoutstanding intrinsic pathways, the p53 pathway, is actuated from DNAharm that outcomes from oxidative anxiety(Wang and Lippard 2005). It is assumed that AgNPs prompt apoptosis by performing as intrinsic stimuli because of their capacity to yieldROS and cause DNA double-strand breaks (DSBs) (Foldbjerg et al. 2009; Thubagere and Reinhard 2010). The sub-G1 populace in HSC-3 cells after incubation with NLS/ RGD-AgNPs and the live neighboring cells, which additionally contain NLS/RGD-AgNPs, move inside close closeness to the dying cell and continue to engulf the apoptotic cell. Apoptosis is essential for keepingup homeostasis and variable tissue development(Alenzi 2004). Phagocytes, for example, macrophages and immature dendritic cells, encourage apoptotic cell evacuation. For cell evacuation to happen, apoptotic cells show "eat me" signs on their cell surface to invitespecialized phagocytes and help in their succeeding engulfment (Grimsley and Ravichandran 2003). Afterward the apoptotic cell had been identified, the live neighboring cells continued to engulf the dying cell. Engulfment was recommended by the merger of the live and dying cells, which brought on the live cell to end updistinctly unfocused and splendid white, similar to apoptotic cell (Parnaik et al. 2000).

c) Cell cycle arrest

PS-NH2 can initiate a type of cell cycle capture. The cell cycle incorporatesevery one of the occasions amid a cell's life that prompt to its duplication, division, deregulation and its interruption is at the beginning of cell death (Kyriakis and Avruch 2001). In G1 phase AgNPs uncovered cells a decrease in the G1 populace, supplemented by an increase in the G2/M populace, was perceived. Genuine increments in the quantities of cells in the G2/M and S phases were observed in these uncovered cells. A fleeting investigation discovered that after 12 and 24 h of acquaintance, AgNPs prompt to genuine declines in cells in the G1 phase and increments in cells in the G2/M and S phases. An increment in the G2/M and S phases and abatement in the G1 phase on introduction to AgNPs these AgNPs may bring about genuine cell damage. Enlistment of cell cycle capture is frequently the beginning of anti-cancer therapeutics (Kim et al. 2004). The amount of cells with a sub-diploid DNA content expanded in cells visible to AgNPs in introduction fixation and presentation term subordinate conduct which unequivocally proposes DNA damage and apoptosis might be included in AgNPs poisonous quality. DNA damage is normally accompanied by cell cycle capture.

Table 1: An overviewof plant mediated silver nanoparticles synthesis and mode of action against breast cancer cell lines.

Sr. No.	Plants	Plant's part	Cell line	Size(nm)	Shape	Modeof action	References
1	Achillea Biebersteinii	Flower	MCF-7	12	Spherical, pentagonal	Apoptosis	(Baharara et al. 2015)
2	Alternanthera Sessilis	Aerial parts	MCF-7	10–30	Spherical	Apoptosis	(Lalitha 2015)
3	Andrographis Echioides	Leaf	MCF-7	68.06	Cubic, pentagonal, hexagonal	Cell cycle arrest	(Elangovan et al. 2015)
4	Azadirachta Indica	Leaf	MCF-7	<40	Spherical	-	(Mittal et al. 2016)
5	Butea Monosperma	Leaf	MCF-7	20–80	Spherical	-	(Patra et al. 2015)
6	Citrullus colocynthis	Leaf	MCF-7	13. 37	Spherical	Apoptosis	(Shawkey et al. 2013)
7	Erythrina indica	Roots	MCF-7	20 –118	Spherical	-	(Sre et al. 2015)

8	Melia dubia	Leaf	MCF-7	7.3	Irregular	Apoptosis	(Kathiravan et al. 2014)
9	Olax scandens	Leaf	MCF-7	30–60	Spherical	ROS and Cell cycle arrest	(Bhadra et al. 2014)
10	Piper longum	Fruit	MCF-7	46	Spherical	Apoptosis	(Reddy et al. 2014)
11	Oak hull	Fruit	MCF-7	40	Spherical	-	(Heydari and Rashidipour 2015)
12	Rheum emodi	Root	MCF-7	27.5	Spherical	-	(Sharma et al. 2015)
13	Sesbania grandiflora	Leaf	MCF-7	22	Spherical	Apoptosis	(Jeyaraj et al. 2013)
14	Solanum Trilobatum	Fruit	MCF-7	41.90	Spherical, polygonal	Apoptosis	(Ramar et al. 2015)
15	Syzygium cumini	Flower	MCF-7	<40	Spherical	-	(Mittal et al. 2016)
16	Ulva lactuca (algae)	-	MCF-7	56	Spherical	-	(Yehia and Al-Sheikh 2014)
17	Ganoderma neo-japonicum Imazeki		MDA-MB-231	45	-	ROS and Apoptosis	(a John 2013)
18	Cannonball (Couroupita guianensis)	Leaf	MCF-7	28.4	-	-	(Devaraj et al. 2013)
19	Annona squamosa	Leaf	MCF-7	20-100	spherical	Apoptosis	(Vivek et al. 2012)
20	Acalypha indica	Leaf	MDA-MB-231	less than 30	cubic face-centred gold	Apoptosis and caspase-3 activation	(Krishnaraj et al. 2014)
21	Dendrophthoe falcate	Leaf	MCF-7	5–45	spherical	Apoptosis and caspase-3 activation	(Sathishkumar et al. 2014)

It is discussed above that biologically synthesis is good way to diminish the usage of harmful materials to human wellbeing and to atmosphere. Major population of plants which is based on medicinal plants is used for different disease to cure [10]. Nanotechnology is advanced field in which nanoscale principle and techniques which utilize bio-materials to generate novel integrated systems. Nano-medicine is the most fascinating field which is quickly creating and utilize dormant metals like silver, gold, and platinum to blend metallic nanoparticles and these NPs are delivered with high therapeutic potential which is utilized as a part of different biomedical applications [11]. Synthesis methods like physical synthesis and chemical synthesis of NPs have some drawbacks like it may occupy huge planetary, expends a great measure of vitality to raising the natural temperature around the source material and consume more power than several kilowatts [25-27]. These approaches are very expensive it may produce concentrated sludge and high cost of electricity is required [28]. And production of that sludge contains the concentrated impurities which do not settle well and are hazardous to all living life and environment [29]. Some synthesis approaches have half-life, regularly being 20 min and its dependability being influenced by the nearness of pH, salts, and temperature [30].

Biologically synthesis is a good way to reduce the waste production which is hazardous to human health and environment. This method is not expensive and no high cost of electricity is required and do not produce any impurities to environment. It is alternative to chemical and physical methods [31]. Chemical and Physical methods use high radiation, highly concentrated reductants and stabilizing agents which are dangerous for the living life. Biomemetic synthesis of nanoparticles is a solitary stride bio-decrease technique and less vitality is utilized to synthesis [32]. Silver NPs synthesis is on top of attention because of its simplicity, easy process and eco-friendly and do not affect living cells [34]. AgNPs are increasing much enthusiasm for the field of nanomedicine because of their unique properties and remedial potential in treating an assortment of illnesses [16] and turn out to be progressively well known as an anti-microbial agents in material and wound dressings, therapeutic gadgets, and apparatuses, for example, fridges and clothes washers [35]. Breast cancer is common; without a doubt the quantity of women with complications and side-effects is expansive. Many sorts of cancers at first react to chemotherapy, however later get to be distinctly resistant [3,4]. The accessible chemo preventives and chemotherapeutic operators cause undesirable symptoms [5,6] in this way building up a biocompatible and beneficial procedure of treatment for cancer is important. Nanotechnology is involve in several applications, like therapeutics, [12] biomedicine due to its manufacturing procedure, [13] quality control, and biocompatibility, and its utilization in wound recuperating. Some cytotoxic agents are utilized as a part of the treatment of breast cancer, for example, doxorubicin, cisplatin, and bleomycin, which is important to discover novel remedial operators against cancer [14].

Recommendation and future perspective

Biocompatibility of green synthesized AgNPs near ordinary cells and self-fluorescence is the establishment to another generation in the treatment and diagnosis of cancer. AgNPs indicates their bright future as a potential agent for cancer treatment and analysis. The properties of biogenic AgNPs can possibly be substituted by radiolabeled isotopes for tumor discovery in patient's bodies bared to radiotherapy, prompt to lessen its symptoms. Characterization and poisonous quality screening of biogenic AgNPs is required before it's commercially invention. Originality and all the dares in the biogenic AgNPs may turn into a potential cancer nanomedicine soon. Numerous parameters, for example, pH, temperature and time require for incubation advancement to limit polydispersity in biologically synthesized AgNPs. The phytochemicals of plants accountable for decrease and adjustment of biogenic nanoparticles which need to know in research to figure out which dynamic functional group is more proficient in biogenic AgNP making. Biological synthesis of nanoparticles for malignancy treatment plus determination is still in its underlying stages and needs a considerable measure of research.

References

1. Chan K, Morris GJ (2006) Chemoprevention of breast cancer for women at high risk. In: Seminars in oncology,. Elsevier 642-646.
2. Jemal A, Thomas A, Murray T, Thun M (2002) Cancer statistics, 2002. CA: a cancer journal for clinicians 52: 23-47.
3. Johnston SR (1997) Acquired tamoxifen resistance in human breast cancer-potential mechanisms and clinical implications. Anti-cancer drugs 8: 911-930.
4. Lupu R, Cardillo M, Cho C, Harris L, Hijazi M, et al. (1996) The significance ofheregulin in breast cancer tumor progression and drug resistance. Breast cancer research and treatment 38: 57-66.
5. Brown K (2002) Breast cancer chemoprevention: risk-benefit effects of the antioestrogen tamoxifen. Expert opinion on drug safety 1: 253-267.
6. Smith LL, Brown K, Carthew P, Lim C-K, Martin EA, et al. (2000) Chemoprevention of breast cancer by tamoxifen: risks and opportunities. Critical reviews in toxicology 30: 571-594.
7. Atchley DP, Albarracin CT, Lopez A, Valero V, Amos CI, et al. (2008) Clinical and pathologic characteristics of patients with BRCA-positive and BRCA-negative breast cancer. Journal of Clinical Oncology 26: 4282-4288.
8. Rashid MU, Muhammad N, Bajwa S, Faisal S, Tahseen M, et al. (2016) High prevalence and predominance of BRCA1 germline mutations in Pakistani triple-negative breast cancer patients. BMC cancer 16: 673.
9. Ghoncheh M, Momenimovahed Z, Salehiniya H (2016) Epidemiology, incidence and mortality of breast cancer in Asia. Asian Pac J Cancer Prev 17: 47-52.
10. Nadagouda MN, Varma RS (2006) Green and controlled synthesis of gold and platinum nanomaterials using vitamin B2: density-assisted self-assembly of nanospheres, wires and rods. Green Chemistry 8: 516-518.
11. Nakkala JR, Mata R, Gupta AK, Sadras SR (2014) Biological activities of green silver nanoparticles synthesized with Acorous calamus rhizome extract. European journal of medicinal chemistry 85: 784-794.
12. Liu H, Liu Y, Wang Z, He P (2010) Facile synthesis of monodisperse, size-tunable SnS nanoparticles potentially for solar cell energy conversion. Nanotechnology 21: 105707.
13. Ragaseema V, Unnikrishnan S, Krishnan VK, Krishnan LK (2012) The antithrombotic and antimicrobial properties of PEG-protected silver nanoparticle coated surfaces. Biomaterials 33: 3083-3092.
14. Fong J, Wood F (2006) Nanocrystalline silver dressings in wound management: a review. international Journal of Nanomedicine 1: 441.
15. Sriram MI, Kanth SBM, Kalishwaralal K, Gurunathan S (2010) Antitumor activity of silver nanoparticles in Dalton's lymphoma ascites tumor model. Int J Nanomedicine 5: 753-762.
16. Gurunathan S, Kalishwaralal K, Vaidyanathan R, Venkataraman D, Pandian SRK, et al. (2009) Biosynthesis, purification and characterization of silver nanoparticles using Escherichia coli. Colloids and Surfaces B: Biointerfaces 74: 328-335.
17. Murray C, Sun S, Doyle H, Betley T (2001) Monodisperse 3d transition-metal (Co, Ni, Fe) nanoparticles and their assembly intonanoparticle superlattices. Mrs Bulletin 26: 985-991.
18. Sun Y, Yin Y, Mayers BT, Herricks T, Xia Y et al. (2002) Uniform silver nanowires synthesis by reducing AgNO3 with ethylene glycol in the presence of seeds and poly (vinyl pyrrolidone). Chemistry of Materials 14: 4736-4745.
19. Yin B, Ma H, Wang S, Chen S (2003) Electrochemical synthesis of silver nanoparticles under protection of poly (N-vinylpyrrolidone). The Journal of Physical Chemistry B 107: 8898-8904.
20. Dimitrijevic NM, Bartels DM, Jonah CD, Takahashi K, Rajh T, et al. (2001) Radiolytically induced formation and optical absorption spectra of colloidal silver nanoparticles in supercritical ethane. The Journal of Physical Chemistry B 105: 954-959.
21. Callegari A, Tonti D, Chergui M (2003) Photochemically grown silver nanoparticles with wavelength-controlled size and shape. Nano Letters 3: 1565-1568.
22. Zhang L, Shen Y, Xie A, Li S, Jin B, et al. (2006) One-step synthesis of monodisperse silver nanoparticles beneath vitamin E Langmuir monolayers. The Journal of Physical Chemistry B 110: 6615-6620.
23. Swami A, Selvakannan P, Pasricha R, Sastry M (2004) One-step synthesis of ordered two-dimensional assemblies of silver nanoparticles by the spontaneous reduction of silver ions by pentadecylphenol Langmuir monolayers. The Journal of Physical Chemistry B 108: 19269-19275.
24. Naik RR, Stringer SJ, Agarwal G, Jones SE, Stone MO, et al. (2002) Biomimetic synthesis and patterning of silver nanoparticles. Nature materials 1: 169-172.
25. Kruis FE, Fissan H, Rellinghaus B (2000) Sintering and evaporation characteristics of gas-phase synthesis of size-selected PbS nanoparticles. Materials Science and Engineering: B 69: 329-334.
26. Magnusson MH, Deppert K, Malm J-O, Bovin J-O, Samuelson L, et al. (1999) Gold nanoparticles: production, reshaping, and thermal charging. Journal of Nanoparticle Research 1: 243-251.
27. Jung JH, Oh HC, Noh HS, Ji JH, Kim SS, et al. (2006) Metal nanoparticle generation using a small ceramic heater with a local heating area. Journal of aerosol science 37: 1662-1670.
28. Mishra G, Tripathy M (1993) A critical review of the treatments for decolourization of textile effluent. Colourage 40: 35-35.
29. Raghavacharya C (1997) Colour removal from industrial effluents: a comparative review of available technologies. Chemical engineering world 32: 53-54.
30. Slokar YM, Le Marechal AM (1998) Methods of decoloration of textile wastewaters. Dyes and pigments 37: 335-356.
31. Banat IM, Nigam P, Singh D, Marchant R (1996) Microbial decolorization of textile-dyecontaining effluents: a review. Bioresource technology 58: 217-227.
32. Shankar SS, Ahmad A, Pasricha R, Sastry M (2003) Bioreduction of chloroaurate ions by geranium leaves and its endophytic fungus yields gold nanoparticles of different shapes. Journal of Materials Chemistry 13: 1822-1826.
33. Iravani S, Korbekandi H, Mirmohammadi S, Zolfaghari B (2014) Synthesis of silver nanoparticles: chemical, physical and biological methods. Research in pharmaceutical sciences 9: 385.
34. Krishnaraj C, Jagan E, Rajasekar S, Selvakumar P, Kalaichelvan P, et al. (2010) Synthesis of silver nanoparticles using Acalypha

indica leaf extracts and its antibacterial activity against water borne pathogens. Colloids and Surfaces B: Biointerfaces 76: 50-56.
35. Chen X, Schluesener H (2008) Nanosilver: a nanoproduct in medical application. Toxicology letters 176: 1-12.
36. Tian J, Wong KK, Ho CM, Lok CN, Yu WY, et al. (2007) Topical delivery of silver nanoparticles promotes wound healing. ChemMedChem 2: 129-136.
37. Ahmed S, Ahmad M, Swami BL, Ikram S (2016) A review on plants extract mediated synthesis of silver nanoparticles for antimicrobial applications: a green expertise. Journal of advanced research 7: 17-28.
38. Ahmad N, Sharma S, Alam MK, Singh V, Shamsi S, et al. (2010) Rapid synthesis of silver nanoparticles using dried medicinal plant of basil. Colloids and Surfaces B: Biointerfaces 81: 81-86.
39. Sun Q, Cai X, Li J, Zheng M, Chen Z, (2014) Green synthesis of silver nanoparticles using tea leaf extract and evaluation of their stability and antibacterial activity. Colloids and Surfaces A: Physicochemical and Engineering Aspects 444: 226-231.
40. de Sanctis O (2013) Electrochemical method for Ag-PEG nanoparticles synthesis. Journal of Nanoparticles 2013.
41. Jiang J, Oberdörster G, Biswas P (2009) Characterization of size, surface charge, and agglomeration state of nanoparticle dispersions for toxicological studies. Journal of Nanoparticle Research 11: 77-89.
42. Kumar PV, Pammi S, Kollu P, Satyanarayana K, Shameem U, et al. (2014) Green synthesis and characterization of silver nanoparticles using Boerhaavia diffusa plant extract and their anti bacterial activity. Industrial Crops and Products 52: 562-566.
43. MubarakAli D, Thajuddin N, Jeganathan K, Gunasekaran M (2011) Plant extract mediated synthesis of silver and gold nanoparticles and its antibacterial activity against clinically isolated pathogens. Colloids and Surfaces B: Biointerfaces 85: 360-365.
44. Sadeghi B, Gholamhoseinpoor F (2015) A study on the stability and green synthesis of silver nanoparticles using Ziziphora tenuior (Zt) extract at room temperature. Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 134: 310-315.
45. Bensaude-Vincent B, Hessenbruch A (2004) Materials Science: A field about to explode? Nature Materials 3: 345-347.
46. Jones R (2009) Nanotechnology, energy and markets. Nature nanotechnology 4: 75-75.
47. Mahmoudi M, Azadmanesh K, Shokrgozar MA, Journeay WS, Laurent S, et al. (2011) Effect of nanoparticles on the cell life cycle. Chemical reviews 111: 3407-3432.
48. Mazzola L (2003) Commercializing nanotechnology. Nature biotechnology 21: 1137-1143
49. Jones CF, Grainger DW (2009) In vitro assessments of nanomaterial toxicity. Advanced drug delivery reviews 61: 438-456.
50. Chaudhuri P, Paraskar A, Soni S, Mashelkar RA, Sengupta S, et al. (2009) Fullerenol− Cytotoxic Conjugates for Cancer Chemotherapy. ACS nano 3: 2505-2514.
51. Chekhun V, Todor I, Lukyanova NY, Shpyleva S, Naleskina L,et al. (2009) The use of nanoferromagnetics to increase the cytotoxic effect of antitumor drugs. Exp oncol 31:163-167
52. Santos HA, Hirvonen J (2012) Nanostructured porous silicon materials: potential candidates for improving drug delivery. Nanomedicine 7: 1281-1284.
53. Sarparanta MP, Bimbo LM, Mäkilä EM, Salonen JJ, Laaksonen PH, et al. (2012) The mucoadhesive and gastroretentive properties of hydrophobin-coated porous silicon nanoparticle oral drug delivery systems. Biomaterials 33: 3353-3362.
54. Kim D-W, Hong G-H, Lee H-H, Choi S-H, Chun B-G, et al. (2007) Effect of colloidal silver against the cytotoxicity of hydrogen peroxide and naphthazarin on primary cultured cortical astrocytes. International Journal of Neuroscience 117: 387-400.
55. Moustafa MH, Sharma RK, Thornton J, Mascha E, Abdel-Hafez MA, et al. (2004) Relationship between ROS production, apoptosis and DNA denaturation in spermatozoa from patients examined for infertility. Human Reproduction 19: 129-138.
56. Simon H-U, Haj-Yehia A, Levi-Schaffer F (2000) Role of reactive oxygen species (ROS) in apoptosis induction. Apoptosis 5: 415-418.
57. Foldbjerg R, Olesen P, Hougaard M, Dang DA, Hoffmann HJ, et al. (2009) PVP-coated silver nanoparticles and silver ions induce reactive oxygen species, apoptosis and necrosis in THP-1 monocytes. Toxicology letters 190: 156-162
58. Thubagere A, Reinhard BrM (2010) Nanoparticle-induced apoptosis propagates through hydrogen-peroxide-mediated bystander killing: insights from a human intestinal epithelium in vitro model. ACS nano 4: 3611-3622.
59. Gerschenson L, Rotello R (1992) Apoptosis: a different type of cell death. The FASEB Journal 6: 2450-2455.
60. Hugo F, Mazurek S, Zander U, Eigenbrodt E (1992) In vitro effect of extracellular AMP on MCF-7 breast cancer cells: Inhibition of glycolysis and cell proliferation. Journal of cellular physiology 153: 539-549.
61. Alenzi FQ (2004) Links between apoptosis, proliferation and the cell cycle. British journal of biomedical science 61: 99-102.
62. Jacobson MD, Weil M, Raff MC (1997) Programmed cell death in animal development. Cell 88: 347-354.
63. Wang D, Lippard SJ (2005) Cellular processing of platinum anticancer drugs. Nature reviews Drug discovery 4: 307-320.
64. Grimsley C, Ravichandran KS (2003) Cues for apoptotic cell engulfment: eat-me, don't eat-me and come-get-me signals. Trends in cell biology 13: 648-656.
65. Parnaik R, Raff MC, Scholes J (2000) Differences between the clearance of apoptotic cells by professional and non-professional phagocytes. Current Biology 10: 857-860.
66. Kyriakis JM, Avruch J (2001) Mammalian mitogen-activated protein kinase signal transduction pathways activated by stress and inflammation. Physiological reviews 81: 807-869.
67. Kim H, Liu X, Kohyama T, Kobayashi T, Conner H, et al. (2004) Cigarette smoke stimulates MMP-1 production by human lung fibroblasts through the ERK1/2 pathway. COPD: Journal of Chronic Obstructive Pulmonary Disease 1: 13-23
68. Baharara J, Namvar F, Ramezani T, Mousavi M, Mohamad R, et al. (2015) Silver nanoparticles biosynthesized using Achillea biebersteinii flower extract: apoptosis induction in MCF-7 cells via caspase activation and regulation of Bax and Bcl-2 gene expression. Molecules 20: 2693-2706.
69. Lalitha P (2015) Apoptotic efficacy of biogenic silver nanoparticles on human breast cancer MCF-7 cell lines. Progress in biomaterials 4: 113-121.
70. Elangovan K, Elumalai D, Anupriya S, Shenbhagaraman R, Kaleena P,et al. (2015) Phyto mediated biogenic synthesis of silver nanoparticles using leaf extract of Andrographis echioides and its bio-efficacy on anticancer and antibacterial activities.

Journal of Photochemistry and Photobiology B: Biology 151: 118-124.
71. Mittal AK, Thanki K, Jain S, Banerjee UC (2016) Comparative studies of anticancer and antimicrobial potential of bioinspired silver and silver-selenium nanoparticles. Applied Nanomedicine 1: 1-6.
72. Patra S, Mukherjee S, Barui AK, Ganguly A, Sreedhar B,et al. (2015) Green synthesis, characterization of gold and silver nanoparticles and their potential application for cancer therapeutics. Materials Science and Engineering: C 53: 298-309.
73. Shawkey AM, Rabeh MA, Abdulall AK, Abdellatif AO (2013) Green nanotechnology: Anticancer Activity of Silver Nanoparticles using Citrullus colocynthis aqueous extracts.
74. Sre PR, Reka M, Poovazhagi R, Kumar MA, Murugesan K (2015) Antibacterial and cytotoxic effect of biologically synthesized silver nanoparticles using aqueous root extract of Erythrina indica lam. Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 135: 1137-1144.
75. Kathiravan V, Ravi S, Ashokkumar S (2014) Synthesis of silver nanoparticles from Melia dubia leaf extract and their in vitro anticancer activity. Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 130: 116-121.
76. Bhadra MP, Sreedhar B, Patra CR (2014) Potential theranostics application of bio-synthesized silver nanoparticles (4-in-1 system). Theranostics 4: 316-335.
77. Reddy NJ, Vali DN, Rani M, Rani SS (2014) Evaluation of antioxidant, antibacterial and cytotoxic effects of green synthesized silver nanoparticles by Piper longum fruit. Materials Science and Engineering: C 34: 115-122.
78. Heydari R, Rashidipour M (2015) Green synthesis of silver nanoparticles using extract of oak fruit hull (Jaft): synthesis and in vitro cytotoxic effect on MCF-7 cells. International journal of breast cancer 2015.
79. Sharma D, Ledwani L, Bhatnagar N (2015) Antimicrobial and cytotoxic potential of silver nanoparticles synthesized using Rheum emodi roots extract. Annals of West University of Timisoara Series of Chemistry 24: 121.
80. Jeyaraj M, Sathishkumar G, Sivanandhan G, MubarakAli D, Rajesh M,et al. (2013) Biogenic silver nanoparticles for cancer treatment: an experimental report. Colloids and Surfaces B: Biointerfaces 106: 86-92.
81. Ramar M, Manikandan B, Marimuthu PN, Raman T, Mahalingam A, et al. (2015) Synthesis of silver nanoparticles using Solanum trilobatum fruits extract and its antibacterial, cytotoxic activity against human breast cancer cell line MCF 7. Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 140: 223-228.
82. Yehia RS, Al-Sheikh H (2014) Biosynthesis and characterization of silver nanoparticles produced by Pleurotus ostreatus and their anticandidal and anticancer activities. World Journal of Microbiology and Biotechnology 30: 2797-2803.
83. A John P (2013) Green synthesis of silver nanoparticles using Ganoderma neo-japonicum Imazeki: a potential cytotoxic agent against breast cancer cells. International journal of nanomedicine 8: 4399-4413.
84. Devaraj P, Kumari P, Aarti C, Renganathan A (2013) Synthesis and characterization of silver nanoparticles using cannonball leaves and their cytotoxic activity against MCF-7 cell line. Journal of nanotechnology 2013.
85. Vivek R, Thangam R, Muthuchelian K, Gunasekaran P, Kaveri K,et al. (2012) Green biosynthesis of silver nanoparticles from Annona squamosa leaf extract and its in vitro cytotoxic effect on MCF-7 cells. Process Biochemistry 47: 2405-2410.
86. Krishnaraj C, Muthukumaran P, Ramachandran R, Balakumaran M, et al. (2014) Acalypha indica Linn: biogenic synthesis of silver and gold nanoparticles and their cytotoxic effects against MDA-MB-231, human breast cancer cells. Biotechnology Reports 4: 42-49.
87. Sathishkumar G, Gobinath C, Wilson A, Sivaramakrishnan S (2014) Dendrophthoe falcata (Lf) Ettingsh (Neem mistletoe): a potent bioresource to fabricate silver nanoparticles for anticancer effect against human breast cancer cells (MCF-7). Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy 128: 285-290.