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Review Article

Nanobiosensors-their Applications in the Medicinal Plants Industry

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Abstract

For centuries, herbal drugs have been the only accessible resource for treatment of pain and passions. Today, despite remarkable progress and development of synthetic drugs, medicinal plants and their derived drugs are used massively. So that, in some countries medicinal plants is inseparable from drugs and treatment systems. More ever, their marketing and economical aspects are more flourishing than other chemical drugs. Monitoring of medicinal plant products is necessary in drug industry. There is increasing demand for development of analytical equipments for the production process, from crude materials to final products. In this case, biosensors can be excellent analytical tools in order to analysis of medicinal plants and their products. This review is going to explain nano-biosensor technology briefly and so their potential application in medicinal plant industry. Some of these applications are monitoring of environment and fast identification of pathogens, determination of toxicities, measurement of different types of secondary metabolites, herbal pharmacology and others.

Key words: Herbal drugs, Medicinal plants, Nano-biosensors, Secondary metabolites

Introduction

For centuries, herbal drugs have been the only accessible resource for treatment of pain and passions. Today, despite remarkable progress and development of synthetic drugs, medicinal plants and their derived drugs are used massively. So that, in some countries medicinal plants is inseparable from drugs and treatment systems. More ever, their marketing and economical aspects are more flourishing than other chemical drugs. At the present, trade financial turnover of medicinal plants and especially herbal drugs is 60 billiard dollars and forecasted that this digit will be five thousands billiard dollar in 2050.While, the total export of medicinal plants and the derivative of herbal drugs from Iran is about 100 -150 million dollars[1]. Therefore, instead of sold of crude material, we should export processed material, especially in the form of drugs. To reach this important, high science and technologies should be applied [1]. Consumers are looking for high-quality products, in particular products that have a direct relationship with their health and treatment, and this has severed economic effects for producers. If producers consider these demands and consumer favorites, they will reach to the good benefits. But if neglected, it will have severe low financial consequences. Today, global demands for organic medicinal plants and traditional medicine are a suitable opportunity for incoming. Therefore, our country (Iran) because of its high potential of culture and development of this industry and so in order to enter and stable presence in global marketing should using high technologies such as nano-biosensors. One of these new technologies is nano-biosensor.In fact, public concerns on the one hand and strict legislation to import of medicinal

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product needs suitable control and analysis of medicinal plants. Common analyzing methods need to send samples to a laboratory and this process usually is expensive, time consuming and need experienced operator. But today, researchers are looking to monitor farms and processing of herbal drugs using biosensors as a fast, sensitive, low cost and reliable analytical technique[2].A biosensor is an analytical device, used for the detection of an analyze that combines a biological component with a physicochemical detector and contain 3 main parts [3]: 1) The sensitive biological element (e.g. tissue, microorganisms, organelles, cell receptors, enzymes, antibodies, nucleic acids, etc.), a biologically derived material or biomimetic component that interacts (binds or recognizes) the analyze under study. The biologically sensitive elements can also be created by biological engineering.2) The transducer or the detector element (works in a physicochemical way; optical, piezoelectric, electrochemical, etc.) that transforms the signal resulting from the interaction of the analyst with the biological element into another signal (i.e., transducers) that can be more easily measured and quantified. 3) Biosensor monitors with the associated electronics or signal processors that are primarily responsible for the display of the results in a user-friendly way.

Today, biosensors are using in various fields such as: medicine, chemical industry, food industry, monitoring of environment and production of drug and healthy materials. These sensors are powerful tools for the identification and measurement of molecules. The best example of the biosensor is the human senses of smell and taste [4]. In fact, biosensors are analytical devices that using the intelligence of biological materials, they can react with analyze and identifying compounds. The results of this reaction can be a chemical, optical, thermal or electrical signal/s. The highest application of biosensors is medicinal diagnostics and laboratory science. At the present time the glucose biosensors are the most successful biosensors in the market [5].

Kinds of biosensors based on biological sensor type

The importance of biological sensors is their very specific function for a specific substrate, so that using this specifies prevent the interference of troublesome materials that cause lack of efficiency in other measurement methods. Biological sensor may catalyze the substrate reaction (enzyme) or selectively bond to the substrate. Using of enzymes as biological sensors are more common than the other sensors. Biological sensors are the main part of biosensors that only bond to specific substrate no other analyses. There are five groups of biosensors based on the type of sensors:1) enzymes 2) antibodies 3) oligonucleotides (aptamers) 5) microorganism, organ, cell and etc. Because other kinds of bio-receptors are more familiar, only biosensors that using aptamers as bio-receptor is explained here.

Aptamers

One of the most important factors of identifying of an analyte is using an identifier molecule with high selectivity and affinity for target analyte. One of the common receptors is antibodies that applied in a lot of immunological detection methods and biosensors. But during the research to find the best identifier, scientist encountered oligonucleotides that have ability to bond to proteins and other substances selectively. In 1990, this small and single stranded oligonucleotides that bond to biological molecules with high selectivity and affinity called Aptamer [6]. During this year, a specific method known as Systematic Evolution of Ligands by Exponential enrichment (SELEX) was introduced for preparing of aptamers from randomly synthesized libraries of oligonucleotides. From that time until now a lot of aptamers for different types of biological molecules such as amino acids, drugs, proteins and other molecules identified [7]. The first step to the synthesis of aptamers is the selection of randomly synthetic library of oligonucleotide. This library consists of a large combinatorial double-stranded oligonucleotide with 40-100 base pairs length that each one composed of two fixed part in the both side of oligonucleotides for amplifying by PCR and a part with variable sequence between these two fixed regions. In order to increasing the efficiency, oligonucleotide bases modified by adding some groups such as amino or methyl to 2′of sugar to resistance against nucleases. In the second step, fixed target molecules on the surface exposed to this library and then unbounded oligonucleotides omitted by washing. The bonded molecules separated from the surface of the target molecule and this second step repeated 6-20 times until obtained specific bounded oligonucleotides. These specific oligonucleotides amplified by PCR, cloned and finally sequenced [8]. Aptamers have unique characteristics that make them excellent in comparison to other identifiers. These characteristics consist of small size, high selectivity, high resistance, and reversibility of structure against a lot of physical changes and possible bounding to varied target molecules, from ions to cancer cells and so microorganisms.

Immobilization methods of biological sensors

To fabrication of sustainable biosensor, the bio-receptor should be attached to the transducer in a special way. This process is called immobilization and there are four methods for this purpose: microcapsulation, entrapment, cross-linking and covalent bounding [9]. Of course, the main designed nano biosensors are using carbon nano tubes and functionalized using varying methods [10-12]. Single walled carbon nanotubes (SWCNTs) are activating by chemical methods, so that their side wall have the ability to covalent binding to bio-receptors.

Kinds of biosensors based on transducer type

Potentiometry:

The signal is measured as the potential difference (voltage) between the working electrode and the reference electrode. The working electrode potential depends on the concentration of the analyte in the gas or solution phase. The reference electrode is needed to provide a defined reference potential. The potential is proportioned with logarithm of target material density [13].

Voltametry

Voltammetry experiments investigate the half-cell reactivity of an analyte. Voltammetry is the study of current as a function of applied potential. These curve I = f(E) are called voltammograms. In this formula I is current, f is function and E is potential. The potential is varied arbitrarily both step by step or continuously, and the actual current value is measured as the dependent variable.

Sensors based on field-effect transistor (FET)*:*

FET is a transistor that uses an electric field to control the shape and hence the conductivity of a channel of one type of charge carrier in a semiconductor material. FETs are unipolar transistors as they involve single-carrier-type operation. We explain more about this transistor in the following sections [14].

Optical transducers:

The optical biosensor may involve direct detection of the target or indirect detection through optically labeled probes, and the optical transducer may detect changes in the absorbance, luminescence, polarization, or refractive index. Applied methods in optical biosensors consist of absorption spectroscopy, fluorescence spectroscopy, internal reflection spectroscopy and Surface Plasmon Resonator [14,15].

Piezoelectric tools

Piezoelectric is the electric charge that accumulates in certain solid materials (such as crystals, certain ceramics, and biological matter such as bone, DNA and various proteins) in response to applied mechanical stress. The word piezoelectricity means electricity resulting from pressure and based on resonance in a crystal [9,15].

Thermal methods

All of the chemical process associated with adsorb or production of energy. This thermal energy can be measured by sensitive thermometer and relate it to reaction intensity [17].

Nano-mechanical biosensors

The cantilever is a beam anchored at only one end. The beam carries the load to the support where it is forced against by a moment and shear stress. Cantilevers are in the micro and nano scale and work based on bending and deviation of the beam or resonance frequency changes resulted from the binding of analyte in the cantilever surface (Fig. 1). Cantilevers are encouraging for nano-biosensors [18].When a bio-molecule reaction occurred on the surface of nano-cantilevers, the identification of molecules by receptors translated to nano-mechanical signals. The cantilever beam commonly connected to an Optical Readout System or Piezo-Resistive Readout System. Piezo-Resistive acts as a transducer of mechanical signal to electrical current. Cantilevers are interesting examples of accompanying of nanotechnology and biotechnology. Biosensors based on cantilever can act in solution, air and vacuum conditions. Development of integrated biosensors for simultaneous detection of important bio-molecules resulted in the advent of bio-chips. Bio-chips are defined as a bed with micro arrays as bio-receptor [18].

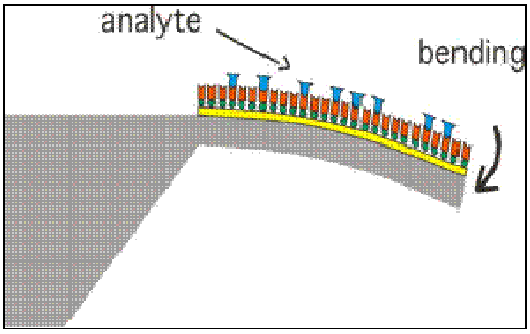

Fig. 1 cantilever bending at the presence of binding of analyte to an immobilized receptor on the cantilever surface

Bio-chips containing of nano cantilevers (as the receptor) don't need to label and fluorescent molecules. Today, a variety of physical, chemical and biological sensors are immobilized on the cantilever surface and used as nano-biosensor. Although, single Identification is developed by cantilevers, but the array of this sensor can provide extra information that not accessible by individual tools. Multi-functional Nano cantilevers with a variety of covers make it possible for measuring of selectively of mixed vapors. The response of the receptor array can be used for identification of combinational of chemical compounds. By using of arrays on a chip and receive the collection of information resulted in decreasing of cost and work in the extend Variety of applications [19]. Recently application of biosensors has been looking for the real time and low cost devices that applicable by any user, at any time and location [18]. To portable of biosensors, omitting of environmental effects and automation of functions of biosensor is necessary. Cantilevers can convert some phenomenon such as changes of mass, pressure, temperature and moisture to deflection (static method) or changes in resonance frequency(dynamic method) and used in the structure of biosensors as the high selective transducer of chemical signal to mechanical ones. When molecule's surface adsorbent is limited to one surface of the cantilever, induced surface pressure bending cantilever and cantilever resonance frequency is changed simultaneously. Bending and changing in resonance frequency can be measured by techniques such as: Optical Beam Deflection, Piezo-resistivity, Piezo-electricity, Interferometry and changes of the capacity of capacitor [18].

Some application of nano-biosensors in medicinal plant's industry

In the following section, the biosensors that used for monitoring of environment are explained. Then applied biosensors to monitoring of quality of medicinal plant and so detection of specific secondary metabolite/s will review.

Monitoring of cultivation environment of medicinal plant (detections of pathogens)

Standard methods of identifying both *Escherichia coli* and *Bacillus cereus* require at least a full day (to rule out a negative sample) and up to several days (to confirm a positive result).There has been much research directed toward developing rapid detection methods for these organisms. The most practical methods begin with extraction, purification, and concentration of target cells, to eliminate long enrichment steps and interference from matrix samples during the detection process. One of the efficient extraction and concentration method is immonomagnetic separation (IMS). In the immunomagnetic separation, sample incubates with immune functionalized magnetic nanoparticles (by antibodies), so that bind to target cell and separate from sample matrices using a magnetic field [39].Then the magnetic particle bounded-target cells can be washed and suspended at higher concentrations in the testing medium. In comparison to filtration, centrifuge or capture of target on an immune functionalized surface, immunomagnetic separation is simpler and because of the greater surface area available for target bindingresults in higher captures efficiency. Cyclic voltammetry is a common electrochemical measurement technique in which cyclic electric potential between electrodes is applied and the resulting current is measured [20]. The most electrochemical biosensors are using the micro electrodes on compacted sensor arrays in order to electrochemical activity occurred in tiny scale. Electrochemical cell in these systems is a reaction well in contact with two electrodes (the reference and counter electrodes are usually combined into one in miniaturized systems). The sensing chips often consist of screen-printed electrodes (SPEC) on a glass or plastic substrate [21]. SPEC involves deposition of semi conductive or metallic ink in order to form electrodes with special size and shape. Gold electrodes and SPECs have been applied to detection of *E. coli* and other pathogens [22]. Because of their suitable characterization such as compatibility with biological molecules, simple to synthesize, electrically active and environmental stability, conductive polymers have found applications in nano-biosensors. The best of these polymers is Polyaniline, because its different chemical, physical, and electronic states can be controlled and exploited for various purposes. Polyaniline has well-defined reversible redox chemistry, and is easily recognized in cyclic voltammetry by its characteristic oxidation and reduction peaks [22,23]. Magnetic and conductive nano-particles for IMS and nano-biosensors applications have been reported in various laboratories. The nanoparticle consists of an iron oxide core, imparting magnetic functionality, and a polyaniline shell, imparting electronic activity. In the IMS, magnetic nano-particles/polyaniline (core/shell) called c/sNP, and used for magnetic positioning of target bacterial cells on a SPCEsensor, and as a mediator for current flow (Fig. 2).

An electrochemical detection technique is presented, in which the presence of c/sNP-bound target cells inhibit current response in cyclic voltammetry. This technique can detect *E.coli* and *B. cereus* in low concentrations. The versatility of IMS makes this method applicable for a wide variety of target organisms and sample matrices [20].

Electrochemical detection of bacteria

In a study conducted by Seterington *et al.,* (2012), for any electrochemical test cyclic voltammogram (plot of response current *vs*. applied potential) were recorded. The third scan (of three consecutive scans performed) was chosen for analysis because it shows the most pronounced differences in current flow for different samples. Figure 3 depicts cyclic voltammograms and charge transfer values for pure (a) *B. cereus* and (b) *E. coli* O157:H7 cells suspended in 0.1 M HCl, in the absence of c/sNPs.The presence of cells except in the high concentration has no effect on the electrochemical response. Increasing in the charge transfer in high concentrate can be explained by the conductivity of bacterial cell membrane and cytoplasm [20].

Although low concentrations of *B. cereus* or *E. coli* in the PBS buffer or HCl solution on the sensor, does not significantly influence the current response, a small number of cells complex with c/sNPs and in the presence of excess (un-complex) c/sNPs has a much more pronounced effect on current flow. The conductivity of intact bacterial cells is 10^{-3} to 10^{-2} S/cm, while the conductivity of electro active c/sNPs is 3.3 S/cm. Therefore, when the bacterial cells are bounded to c/sNPs and distributed in the solution, they will act as barriers of current flow.

More ever, an external magnetic field is used to draw c/sNPs to the sensor surface and position cells in a layer directly above the surface, where the electric field is most concentrated and cells have greatest obstacle on current flow. And so, in electrochemical tests on the immuno c/sNP solutions, increasing of bacterial cells on the sensors resulted in decreasing of current response [20].

Detection and measurement of a variety of toxic

Usually microorganisms are used to measure of water and soil toxicity (such as ToxAlert kit of Merck co.). These systems are based on luminescent bacteria like vibriofischerito measure toxicity in biological samples [24]. Some fabricated biosensors to identification of contamination of phenolic compounds are listed in table 1.

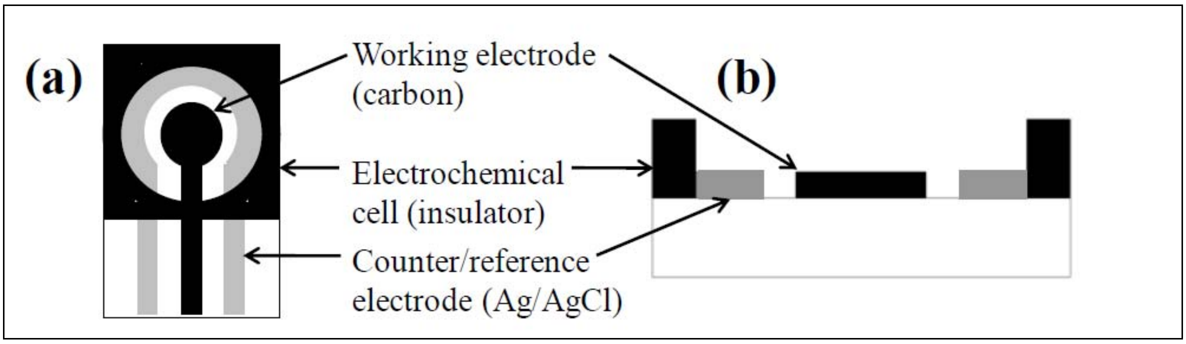

Fig. 2 structure of SPCE sensor: (a) top view; (b) cross-sectional view.

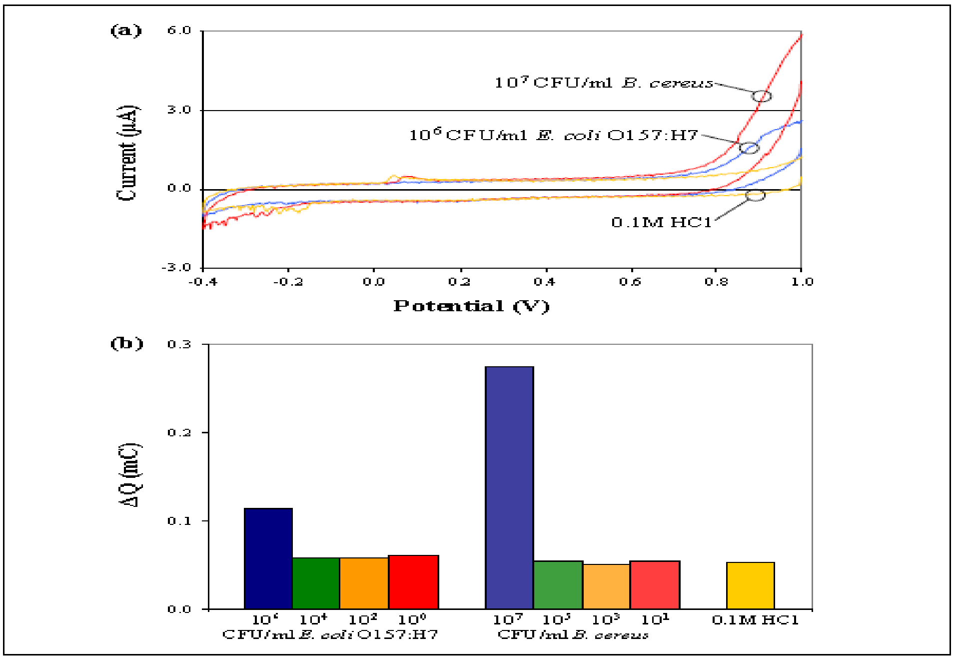

Fig. 3 Cyclic voltammograms (a) and charge transfer values; (b) for electrochemical tests performed on pure *B. cereus* and *E. coli* O157:H7 cells, suspended at various concentrations in 0.1 M HCl solution, in the absence of c/sNPs [20].

Table 1 Some fabricated biosensors to identification of phenolic component contaminations.

Analyte type	Receptor type	Transducer type	Reference
phenol/clorophenol, catechol/phenol, cresol/clorocresol and phenol/cresol	Laccase and tyrosinase	Amperometric multicanal	[25]
m-cresol or catechol	DNA	Amperometric	[26]
Phenol	Mushroom tissue (tyrosinase)	Amperometric	[26]
phenol, p-cresol, m-cresol and catechol	Polyphenol oxidase	Amperometric	[27]

Table 2 Some applied biosensors to monitoring of heavy metals

Analyte type	Receptor type	Transducer type	Reference
Zinc, copper,cadmium andnickel	*Pseudomonas fluorescens*10586s pUCD607 withthe *lux* insertion on a plasmid	Optical (luminometer)	[32]
Cadmium	DNA	Electrochemical	[32]
Mercury, cadmium and arsenic	Urease enzyme	Electrochemical	[33]
Nickel ions	*Bacillus sphaericus* strainMTCC 5100	Electrochemical	[34]
Mercury (II) and lead (II) ions	DNA	Optical	[15]
Copper (I) and (II) ions	DsRed (red fluorescent)protein	Optical	[35]
Cadmium, copper and lead	Sol-gel-immobilizedurease	Electrochemical	[13]

Some of the bio assay methods like as Cellsense are used in biosensors, that is an amperometric sensor and using *E. coli*to rapid toxicity analysis. This method is used ferricyanide as an electron mediator solution in order to transfer electrons form respiratory system of immobilized bacteria on the carbon electrode. Finally the current flow changes show the toxicity amount [2].

Current techniques for determination of heavy metals are ionic chromatography and polarography [28]. But these methods unable to determine fractions that have potential of risk form concentrations that not reach to threshold of risk [29]. Advantage of biosensors that using intact bacteria as bio-receptor is their ability to detect of fractions with danger potential [2]. In these biosensors heavy metals are inhibitors of enzymes of bacterial receptors [30]. In order to detection of specific metal a recombinant bacterial sensor is used. In these systems, reporter genes (such as luciferase) are placed under the controls of induced promoters. When metal is bound to receptor, light is emitted that amount of emitted light is equal to the amount of metal [31].Table 2 listed designed biosensors for heavy metals.

Designing of biosensors for anti-oxidant (polyphenols as case study)

Reactive oxygen species (ROS) and free radicals are destroying the cell walls. When there is no balance between anti-oxidant and ROS, it damages the cells. Therefore, identification of plants that rich in antioxidant is very important. Free radicals, mainly attack to lipo-proteins, specially LDL and membrane phospholipids such as phosphatidyl choline [36]. Therefore, LDL and phosphatidyl choline can be immobilized on carbon nano tubes or other surfaces and used as a biosensor. The reduction process of lipo peroxide electrode and structural changes of LDL and phosphatidyl choline resulted from oxidation of free radicals are measurable [36]. Antioxidant measurement usually based on biosensors that using a special enzyme as receptor, so that bio-receptor element is suitable redox enzymes [16]. The main advantage of redox enzymes in the amperometric biosensors is application of potential value for monitoring of oxidation or reduction of specious on the electrode surface [16]. Polyphenols are the main groups of antioxidants and divided to three classes of phenolic acids, flavonoids and tannins. Nano-biosensors based on immobilization of polyphenol-oxidases are used for the determination of polyphenols. The main oxidation reaction of phenol substrate in the presence of phenol oxidase resulted in production of a Quinone type. More ever, Laccase immobilization on the carbon nano tubes can be used to analyze of polyphenols[36]. And so, Oleuropin have been measured by biosensors containing Laccase bio-receptor and amperometric transducers. In this biosensor purified Laccase from *Trametes versicolor* has been used as a bio-receptor element and cross linking was used for immobilization of receptor on carbon electrode [37].

Detection of anti-bacterial activity of medicinal plants

By designing of suitable nano-biosensors it's possible to determinate and analyses the anti-bacterial properties of medicinal plants. Antibacterial effects of ethanol extraction of 16 medicinal plants were studied by biosensor. Two modified *E. coli* strains that obtained from *E.coli* RFM443 were applied. Both of the tow *E. coli*strains contained plasmids that these plasmids it selves had five structural genes of luxoperon from *Vibrio fischeri* bacteria.In fact, the antibacterial activity of plant extracts was measured by luminescence biosensor [38].

Identification of specific secondary metabolites

Chemical synthesis of secondary metabolites with economic value is expensive and sometimes impossible, and so the value of natural products is much more than the synthetic kinds. Therefore, using of plant resources that have enough quantity and quality of these metabolites are necessary. Identification and determining the exact amount of secondary metabolites in medicinal plants has particular significance. Although, techniques such as HPLC, GC and GC mass are extensively used for detection, but their application is expensive and time consuming. Therefore, using nano-biosensors is recommended strongly.

Application of optical biosensor to measurement of tropane alkaloids

Optical biosensors based on fluorescence can be applied to the determination of tropane alkaloids. This type of biosensor is based on FRET system that using quantum dot's semi-conductive nano crystals and rodamin123 di-florescence as fluorescence probe. The muscarinic M_2R receptor was used as bio-receptor. In the fluorescence resonance energy transfer (FRET)system, transfer of energy from an excited donor chromophore to an acceptor chromophore is through nonradiative dipole–dipole coupling. The efficiency of this energy transfer is inversely proportional to the sixth power of the distance between donor and acceptor, making FRET extremely sensitive to small changes in distance. In fact, the resonance is occurring when transferred energy of emitted wavelength from a donor molecule has overlapping with adsorbed wavelength. It should be considered that this is in the conditions that tow florescence substrate located in less than 10 angstrom distance. The FRET system is based on the distance between light donor and receptor molecules. When two molecules are located in 3-7 angstrom distance, emitted light from a donor molecule adsorbed by receptors. In this state, by exciting of solution containing of donor-acceptor, the amount of adsorbed light in FRER state equal to the amount of adsorbed light by the acceptor. Quantum dots are used as a good donor in this system because they have light absorbance that accordance to acceptor excited light (di-rodamin). Quantum dots as donors of energy in FRET system resulted in the interaction of a donor with multiple acceptors through binding on the quantum dot surface and provide maximum overlapping of emitted spectrum and adsorbed spectrum [14]. Baghery *et al.*, (2013) were reported a nano-biosensor that simply could identified anti-cholinergic agents in plant extract. At the firs, in order to scopolamine bind to rodamin123, alcoholic group of scopolamine was oxidized to aldehyde. In this study nano-bioconjugate of cadmium quantum dot-telluride-thioglycolic acid-muscarinic M receptor (CdTe-TGA-M_2R) acts as energy donor and scopolamine-rodamin123 conjugate as energy acceptor. Antagonist ligand binds to the receptor, don’t activate them, but only block the receptor. Tropan alkaloids are antagonist of muscarinic receptor, that block the transfer of nerve message through cholinergic receptors.

Although, there are other reports of designed biosensors forthe identification of components. An acetyl choline transferaseenzyme-voltammetry biosensor based on combination of gold nano particle-CdTe was applied to the detection of monocrotophos (organophosphors) in medicinal plants. These compounds caused the reversible inhibition of acetyl choline transferase enzyme. Rapid screening for identification of apoptosis induced by different fractions of extraction of *Isodon eriocalyx*was done by FRET biosensor. In order to detection of rosemary acid in the extraction of *Melissa officinalis*, a biosensor based on Lactamase and using of Square Wavevoltamograph have been designed that its identification limits was 1.88×10^{-7} mol/L. and so, a potentiostate biosensor based on choline esterase and field-effect transistor sensitive to pH have been used for sensitive identification of glycol alkaloid, that minimum amount of detection was 0.3 millimolar for alpha chaconine and 1micromolar for solanidin [14].

Disclosing the fraud and replacement in herbal drugs and medicinal plants

In some cases, herbal drugs and medicinal plant are replaced by fake species. Molecular markers such as RAPD, SCAR and RFLP are used successfully in order to differentiate and distinguish these herbs and disclosing of their replacements by other closed relationship species [39]. DNA fingerprinting of *Taraxacum mongolicum* revealed its replacements by six species of composite plants. Along with the Authentication of medicinal species, Prediction of the concentration of active plant chemicals in order to quality controls of plant materials as drug purposes is necessary. Therefore, finding of DNA markers that can show the relationship between DNA finger prints and quality and quantity of phytochemicals has extensive application in quality controls of herbal drugs [39]. As a conclusion from this fact, we can propose that researchers are use this DNA sequences as aptamers and designing apta-biosensor to applied instead of molecular markers.

Nano-biosensors as new tools in herbal pharmacology

Commonly, herbal pharmacology consists of quality concepts using of common botanical and organology of crude drugs. New pharmacology covers all aspects of drug discovery and development. So that biotechnology applications play important roles. Extensive researches based on DNA-molecular markers in a lot of the research institute over the world are progressing. These techniques are used for identification and analysis of important herbal drugs, so that have acceptable application in the quality controls of medicinal plants[39].Although analysis of DNA considered as an important technology in plant pharmacology, but its application is mainly limited to laboratory and application of them in the farm has limitation. Therefore, designing of suitable nano-aptasensors are good suggestion in order to plant pharmacology and other quality and quantity applications.

Results and Discussion

Today, science and technology almost in many fields closed to their frontiers, and maybe cannot respond to increasing human demands.It is here that, nanotechnology presents its ability one after one to human society and became one of the interesting human research fields. Because by using of nanotechnology, human can receive to his long time dreams. Nano-science now help to other science and applied variously. The past decade has seen great advancements in the field of bioanalysis along many fronts. Among the most rapidly advancing of these fronts is the area of biosensing, whether it is single analyte detection methods or multiarray-basedbiochip technology. Biochip technologies could offer a unique combinationof performance capabilities and analytical features of meritnot available in any other bioanalytical system currently available.

Industry of medicinal plant as one of the important economic sectors in the country and world, its stable presence in international markets needs to apply new technologies. Nano-biosensors as a new technique can be a very applicable option to overcome some problems in the medicinal plant industry. Nano-biosensors because of high specify, fast analysis of bio-samples, simply and chip can be used for monitoring and analyzing of the medicinal plant -environments, identification of new components and drugs, herbal pharmacology and measurement of secondary metabolites. Almost, the problem of this technology is the findings of chip and suitable bio-receptors in order to immobilization on proper transducer.

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