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Transgenic plants: Next Generation Plants

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Research Article

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ABSTRACT

Transgenic plants are plants which are genetically modified, by using recombinant DNA techniques or rDNA which attain new characteristics to the plants. These are identified as a class of genetically modified organism (GMO). To improve the production of the crops this method is commonly used for transgenics. For thousands of years this selection has been on going. World population may reach up to nine billions by the year of 2050. To provide food for human needs in the area of the agriculture these transgenic crops are used. Over the recent decades to improve crops there is a need of using this genetic technique. By using this method we can produce the crops with even increased yields and desired traits. These crops can withstand diseases and pests which would allow growing more crops. We can feed the growing population and also produce more desirable products. Its applications have more disadvantages as well as advantages and in future these genetically modified crops have vital debate.

Introduction

By using genetic engineering techniques the DNA is modified to produce transgenic plants [1-19]. The main aim of this method is to introduce a new character to the plant as it does not occur naturally in that particular species [20-22]. Artificially one or more genes are inserted in to the transgenic plant. The gene sequence which is inserted is known as transgene [23-25]. The transgene is either from related, unrelated or it is completely different in species [26]. To make it as more productive and useful some or more combination of genes are inserted in a plant [27,28]. The main advantages of this process is to improve against a variety of biotic and abiotic stresses, shelf life, tolerant to heat, higher yield, cold and drought resistance, pest resistance, improved quality etc [29-35]. These plants are also able to produce some foreign proteins which have pharmaceutical and industrial value [36,37]. Plants made up of antibodies or vaccines are striking as plants are free of human diseases which reduce the cost of bacterial toxins and screening costs for viruses [38-42]. In 1983 the first transgenic plant was reported. In several important agronomic species of plants, many recombinant proteins have been expressed in banana, tomato, cotton, potato, corn, tobacco, canola, alfalfa etc. For preparing vaccines for human beings potatoes and bananas are genetically modified [43].

Transgenic Crops Development

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By adding one or more genes of a plant's genome, by altering the genetic-make-up in a laboratory genetically engineered plants are produced [44]. For the new transgenic DNA nucleus of the plant-cell is the main source. By using Agrobacterium tumefaciens mediated transformation method most of the transgenic plants are developed [45-46]. DNA is bounded with tiny particles of Tungsten or Gold and later subsequently shot into single plant cells or plant tissue with high pressure with the help of gun. These particles now penetrate into cell membranes and cell wall [47,48]. Then the DNA will get separated from the coated metal and now it integrates into the plant genome inside the nucleus. This technique is especially applied for many crops mainly maize or wheat. This method is safe and clean. The main disadvantage in this process is serious damage that can occur in cellular tissue. Another method is also used in this technique with the help of soil-dwelling bacteria, known as Agrobacterium tumefaciens [49,50]. This bacteria has the ability to infect the plant cells with its DNA piece in plant chromosome through a tumor inducing plasmid known as Ti plasmid [51,52]. This plasmid can control the machinery of plants cells and it makes many copies of its own bacterial DNA [53]. This plasmid is a large circular DNA and it can replicate independently. The main use of this plasmid is as it contains some regions known as transfer DNA, in which we can insert a foreign gene. Agrobacterium" is capable of transferring large fragments of DNA [54,55]. Not all important food crops can be infected by these bacteria. This method works effectively for dicotyledonous plants like tobacco, potatoes, and tomatoes plants [56].

Deriving from other species the genes are inserted into transgenic plants. The genes are derived from same kingdoms or different kingdoms. The DNA which is DNA should be modified to express efficiently in host organism [57]. These transgenic plants are used to express proteins, antigens for vaccinations and herbicide resistant genes [58,59].

Transgenic Plants Advantages

1. Genetically Modified Technology has been used to produce a variety of crop plants to date [60].
2. Improves production of yield, enhancing the nutritional content and lowering transportation costs [61,62].
3. Production of commercial varieties [63]
4. Viruses and pests resistance [64]
5. Herbicide resistance tolerance

The Plants which are resistance to herbicides are called Herbicide Resistant Plants.

The active ingredient is Glyphosate and it is a broad spectrum herbicide of Tobacco, Tomato, cotton, potato etc. Bacillus thuringiensis is a bacterium that is pathogenic for a number of insect pests [65-69]. It produces a protein toxin which has a lethal effect. The toxin gene can be inserted directly into the genome of the plant through recombinant DNA method which expresses and provides protection against insect pests of the plant. Tomato plants and TMV resistant tobacco are produced by inserting viral coat proteins [70-72]. The viral resistant transgenic plants are YMV resistant green gram, Potato virus resistant potato plants, YMV resistant black gram, RSV resistant rice etc. Transgenic plants such as papaya are modified as Papaya-ring-spot-virus resistant papaya has been commercialized and grown. In half a million children Vitamin A deficiency causes blindness either totally or partially [73-75]. The staple food for a large fraction of the World's human population is milled rice. For producing crops which contains high concentration of vitamin A this traditional breeding method is used [76].

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Three genes two from daffodils and one from a microorganism should be inserted into rice to produce transgenic rice which has of beta-carotene as a precursor to Vitamin A and the seed is yellow in color. Efficient usage and Water availability is a global issue [77-80]. Soils are subjected to extensive tillage (plowing) for preparing seed beds and controlling weeds [81]. In the treatment and diagnosis of human diseases therapeutic proteins are produced in plants [82]. The proteins produced in transgenic plants for therapeutic use, are of three types vaccines, antibodies and proteins.

Antibodies directed against cholera, certain cancers, hepatitis B virus, rheumatoid arthritis, dental caries, *E. coli* diarrhea, herpes simplex virus, malaria, influenza, rhinovirus etc [83-85]. An anti-cancer antibody has recently expressed in rice and wheat seed that recognizes cells of lung, breast and colon cancer and hence could be useful in both diagnosis and therapy in the future [86,87].

Disadvantages of Transgenic Crops

1. Transgenic crops cause allergies for some people [88]
2. The antibiotic resistance genes which are inserted in these crops have resistance to antibiotics and leads to super bugs and these bugs can't be killed with antibiotic treatments
3. Causes damage to the natural environment [89]
4. Plant and product contamination by endogenous metabolites, pesticides, mycotoxins and herbicides [90]

The Future of Transgenic Crops

Around the globe, genetically modified crops offer a potential solution to food shortages but the viability of their cultivation remains questionable. The main uses of producing these GM crops to enhance health concerns, carries hidden costs in environment, eliminate hunger etc. Some Significant benefits of transgenic crops are:

1. Hybrid seed effective production
2. No usage of insecticide [91]
3. Decreases loss of viruses and insect pests
4. Weed control [92]
5. Resistance against storage pests
6. Increase in nutritional quality [93] (oil in canola)
7. Marketing flexibility
8. For better shelf life
9. Decrease in post-harvest losses
10. Safer environment

In future, the transgenic crops will be used not only for improved agronomic traits, but also for traits involving food processing, pharmaceuticals (including edible vaccines) and specialty chemicals [94,95]. Transgenic rubber tree has also been produced and will be used for a variety of purposes. Thus the future of transgenic crops is bright and optimistic. These goals will be achieved by sustained efforts, both in industrialized and developing countries. The farmers and public will have to respond to this changing scenario [96].

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CONCLUSION

In developing countries we hope to be able to provide medicines in GM foods and vaccinations which are used as medications in future [97]. Medications incorporated into food are easier to transport and can store conventional medicine. There is a great impact on the lives of many as these transgenic plants have much advancement. For administering human antibodies and producing the transgenic plants has an offer to new approach. Biopharmaceuticals like Insulin to treat diabetes and erythropoietin to treat anemia are produced by using genetic engineering method [98]. Future generations of GM plants are intended to be suitable for production of Bioenergy and Biofuels, for harsh environments, enhancement of nutrient content, production of pharmaceutical agents etc [99,100].

REFERENCES

1. Ilardi V. Could Transgenic Plants Expressing Virus-Derived Sequences Create New Routes for Virus Evolution?. Biosafety. 2014;3:e151.
2. DeRenzo C and Gottschalk S. Genetically Modified T-cell Therapy for the Treatment of Osteosarcoma: An Update. J Clin Cell Immunol. 2016;7:417.
3. Malecki M, et al. Eradicationof Human Ovarian Cancer Cells by Transgenic Expression of RecombinantDNASE1, DNASE1L3, DNASE2, and DFFB Controlled by EGFR Promoter: Novel Strategy for Targeted Therapy of Cancer. J Genet Syndr Gene Ther. 2013;4:1-10.
4. Sonoda K, et al. Comparison of Neointimal Tissue Characteristics Between Bare-metal and Second-generation Drug-eluting Stents Nine Months after Implantation in Patients with ST-segment Elevation Myocardial Infarction. J Cardiovasc Dis Diagn. 2016;4:249.
5. Kumar S. Biosafety Issues of Genetically Modified Organisms. Biosafety. 2014;3:e150.
6. Sharma N, et al. Genome Sequence Information in Fruit Crops: Current Status. Transcriptomics. 2016;4:130.
7. Kumar A. Cloning: A Vital Tool for the Production Transgenics. Clon Transgen. 2015; 4:e119.
8. Aydede SK. Geriatric Care at a Time of Accelerated Aging in the World Population and Emerging Global Challenges. J Gerontol Geriatr Res. 2015;4:256.
9. de la Rosa GE and Sow CB. The International Cooperation as a Guarantee for the Satisfaction of Basic Human Needs. J Civil Legal Sci. 2014;3:134.
10. Singh J and Singh CV. Genetic and Phenotypic Parameters of First Lactation and Life Time Traits in Sahiwal Cows. J Vet Sci Technol. 2016;7:345.
11. Al-Rawi R. New Genetic Approach in Early Detection of Cancer. J Mol Biomark Diagn. 2016; 7:292.
12. Günther K, et al. Rapid Monolayer Neural Induction of induced Pluripotent Stem Cells Yields Stably Proliferating Neural Stem Cells. J Stem Cell Res Ther. 2016;6:341.
13. Gawali AS, et al. Genetic Variability in Growth and Seed Traits of Jatropha curcas L. Germplasm for Genetic Tree Improvement. Forest Res. 2016;5:171.
14. Panda T, et al. A Folk Knowledge on Medicinal Plants Used for the Treatment of Skin Diseases in Bhadrak District of Odisha, India. Med Aromat Plants. 2016;5:262.

15. Singh AU and Sharma K. Pests of Mushroom. Adv Crop Sci Tech. 2016;4:213.
16. Zeinalhajlou AA, et al.Necessity of Increasing Elderly Population Awareness about Emergency Medical Services (EMS) Tabriz, Iran. Emerg Med (Los Angel). 2016;6:e145.
17. Butnariu M. Methods of Analysis (Extraction, Separation, Identification and Quantification) of Carotenoids from Natural Products. J Ecosys Ecograph. 2016;6:193.
18. Abedellah A, et al. Pharmaceutical Good Manufacturing Practice Regulatory Affairs in Sudan:Continuous Debate between Regulatory Authority and Manufacturers. Pharmaceut Reg Affairs. 2016;5:166.
19. Sathelly K, et al. Establishment of Efficient Regeneration System from Leaf Discs in Long Pepper an Important Medicinal Plant (Piper longum L.). Med Aromat Plants. 2016;5:248.
20. Moja SJ, et al. Characterization of Surface and Trapped Dust Samples Collected around Human Settlements That are in the Vicinity of Old Mine Tailings in Mpumalanga Province, South Africa. J Earth Sci Clim Change. 2016;7:360.
21. Eldahshan OA, et al. Medicinal Plants and Addiction Treatment. Med Aromat Plants. 2016;5:260.
22. Manohar S, et al. Water Quality and Plant Species Composition of Selected Sites within Chemususudam, Baringo County, Kenya. J Environ Anal Toxicol. 2016;6:390.
23. Abu-Elala NM, et al. Effects of Dietary Supplementation of Spirulina platensis and Garlic on the Growth Performance and Expression Levels of Immune-related Genes in Nile tilapia (Oreochromis niloticus). J Aquac Res Development. 2016;7:433.
24. Ferrari B, et al. “Rc Gene Sequence and Expression Evaluation in a Red-Kernel Rice Genotype”. J Rice Res. 2016;3:146.
25. Gabor G, et al. DNA Profiling of Transgenes in Genetically Modified Plants. J Forensic Biomed. 2016;7:129.
26. Khalid A and Javaid MA. Fibroblast Growth Factors and their Emerging Cancer-Related Aspects. J Cancer Sci Ther. 2016;8:190-205.
27. Igberase GO, et al. Funding Options for Assisted Reproductive Technologies in Developing Countries. J Preg Child Health. 2016;3:264.
28. Assi T, et al. Venous Thrombosis Associated with Peripherally Inserted Central Catheters in Oncology Patients: A Single Institutional Experience. J Palliat Care Med. 2015;5:206.
29. Heidari A. Genomics and Proteomics Studies of Zolpidem, Necopidem, Alpidem, Saripidem, Miroprofen, Zolimidine, Olprinone and Abafungin as Anti-Tumor, Peptide Antibiotics, Antiviral and Central Nervous System (CNS) Drugs. J Data Mining Genomics & Proteomics. 2016;7:e125.
30. Barak S. From Systems Biology to Gene Function: Discovering New Determinants of Plant Tolerance to Abiotic Stresses. Transcriptomics. 2015;3:e111.
31. Muhammad Akhter, et al. Free Fatty Acid Profiling of Rice Bran oils for Improving Shelf Life through Parboiling and Different Treatments. J Nutr Food Sci. 2015;6:449.
32. Ansari MKA, et al. Evaluation of Methyl Red Tolerant Cyanobacteria for Simultaneous Laccase Production and Dye Decolorization. Int J Waste Resour. 2015;6:221.
33. Jayasinghe PS, et al. Effect of Extraction Methods on the Yield and Physiochemical Properties of Polysaccharides Extracted from Seaweed Available in Sri Lanka. Poult Fish Wildl Sci. 2016;4:150.
34. Abou-Elwafa SF. Association Mapping for Drought Tolerance in Barley. Gene Technol. 2016;5:137.

35. Kotikal YK and Math M. Insect and Non-Insect Pests Associated with Drumstick, Moringa oleifera (Lamk.). Entomol Ornithol Herpetol. 2016;5:180.
36. Waghmare P, et al. Excretory Secretory Proteins Released during Growth of Mycobacterium tuberculosis (H37Ra), With Diagnostic Potential in Pulmonary and Extra Pulmonary Tuberculosis. Mycobact Dis. 2016;6:215.
37. Permender R, et al. Novel Statistically Designed Qbd Methodology for Quantitative Analysis of Nisoldipine in Pharmaceutical Dosage Forms. Pharm Anal Acta. 2016;7:489.
38. Saber MM. The Clinical Significance of Both IgM and IgG Anticardiolipin Antibodies in Non-Hodgkin's Lymphoma. J Clin Cell Immunol. 2016;7:436.
39. Mortensen R and Dietrich J. New Generation Combination Vaccines against Streptococcus pyogenes. J Vaccines Vaccin. 2016;7:323.
40. Zhang D, et al. In situ Detection of MicroRNAs: The Art of MicroRNA Research in Human Diseases. J Cytol Histol. 2015;S3:013.
41. Nashar TO. The Quest for an HIV-1 Vaccine Adjuvant: Bacterial Toxins as New Potential Platforms. J Clin Cell Immunol. 2014;5:225.
42. Osman AH. Protein Energy Malnutrition and Susceptibility to Viral Infections as Zika and Influenza Viruses. J Nutr Food Sci. 2016;6:489.
43. Zinchenko AA, et al. Immunogenic and Protective Properties of Recombinant Proteins Based on Meningococcal Iga1 Protease. J Meningitis. 2015;1:102.
44. Jain M. Emerging Role of Metabolic Pathways in Abiotic Stress Tolerance. J Plant Biochem Physiol. 2013;1:108.
45. Georgiev V. Mass Propagation of Plant Cells – An Emerging Technology Platform for Sustainable Production of Biopharmaceuticals. Biochem Pharmacol (Los Angel). 2015;4:e180.
46. Tokdar P, et al. Process and Strain Development for Reduction of Broth Viscosity with Improved Yield in Coenzyme Q10 Fermentation by Agrobacterium tumefaciens ATCC 4452. Ferment Technol. 2013;2:110.
47. Ichihara H, et al. Negatively Charged Cell Membranes-Targeted Highly Selective Chemotherapy with Cationic Hybrid Liposomes against Colorectal Cancer In Vitro and In Vivo. J Carcinog Mutagen. 2016;7:267.
48. Moon M, et al. Tubercle Bacilli in Spinal Tuberculosis - Morphology, Cell Wall Features, Behaviour and Drugs. J Spine. 2015;4:265.
49. Mostafa NM and Singab AN. After HCV Eradication with Sovaldi®, Can Herbs Regenerate Damaged Liver, Minimize Side Effects and Reduce the Bill? Med Aromat Plants. 2016;5:257.
50. Asaduzzaman M, et al. Phytochemicals, Nutritonal Constituents, Anti-bacterial and Hypoglycemic Activity of Aegle Marmelos Lin. Leaf Extract in Alloxan Induced Diabetic Rats. J Nutr Food Sci. 2016;6:533.
51. Kaut O, et al. DNA Methylation of Imprinted Loci on Autosomal Chromosomes and IGF2 are not Affected in Parkinson's Disease Patients Peripheral Blood Monocytes. Brain Disord Ther. 2016; 5:211.
52. Hadi Khan MA, et al. Immunization of Female Mice with a Plasmid DNA Vaccine Coding Eight Repeats of Gonadotrophin Releasing Hormone (Gnrh-I) and Eight T-Helper Epitopes Suppress Fertility In Vivo. J Vaccines Vaccin. 2015;6:282.

53. Maleki A, et al. Promoter Prediction in Bacterial DNA Sequences Using Expectation Maximization and Support Vector Machine Learning Approach. J Data Mining Genomics Proteomics. 2015;6:171.
54. James AK, et al. Range Charts for Agreement in Measurement Comparison Studies, With Application to Replicate Mass Spectrometry Experiments. J Proteomics Bioinform. 2008;1:287-292.
55. Gui H, et al. Evaluation of Factors Impacting Agrobacterium-mediated Indica Rice Transformation of IR58025B - a Public Maintainer Line. J Rice Res. 2016;4:163.
56. Manju S and Paul Khurana SM. Alternative Healthy Food Crops. J Nutr Food Sci. 2014;4:288.
57. Lysenko OB, et al. Biogenic Chemical Elements Isotope Ratios in Living Organism as a New Potential Indicator of Physiological State. J Phys Chem Biophys. 2016;6:218.
58. Rios WM, et al. Fusion of Glioblastoma Tumor Antigens to Herpes Simplex Virus-1 Glycoprotein D Enhances Secondary Adaptive Immune Responses in a DNA Vaccine Strategy. J Vaccines Vaccin. 2015;6:302.
59. Samanta P, et al. Histopathological and Ultrastructural Alterations in Anabas testudineus Exposed to Glyphosate-Based Herbicide, Excel Mera 71 under Field and Laboratory Conditions. J Aquac Res Development. 2016;7:436.
60. Vaisman BL, et al. Exploring Genetically Modified Animals for Development of New Atherosclerosis Treatments in NHLBI. J Mol Genet Med. 2014;8:109.
61. Zaki SS. Effect of Compost and Nitrogen Fertilization on Yield and Nutrients Uptake of Rice Crop under Saline Soil. Mod Chem appl. 2016;4:183.
62. Meghwal M and Goswami TK. A Review on the Functional Properties, Nutritional Content, Medicinal Utilization and Potential Application of Fenugreek. J Food Process Technol. 2012;3:181.
63. Mensah EO, et al. Thermal Stability of β-Amylase Activity and Sugar Profile of Sweet-Potato Varieties during Processing. J Nutr Food Sci. 2016;6:515.
64. Israt AH and Liaquat A. Nonalcoholic Fatty Liver Disease and its association with Insulin Resistance: A Study from Bangladeshi Newly Diagnosed Impaired Glucose Tolerance Subjects. J Diabetes Metab. 2016;7:688.
65. Jofré DM, et al. Studies of Acute and Chronic Toxicity of Commercial Herbicides with Glyphosate against Danio rerio. J Environ Anal Toxicol. 2016;6:340.
66. Uddin G, et al. Broad Spectrum Anticancer Activity of Pistagremic Acid. Chemotherapy. 2013;2:117.
67. Sansinenea E and Ortiz A. An Antibiotic from Bacillus thuringiensis against Gram-Negative Bacteria. Biochem Pharmacol (Los Angel). 2003;2:e142.
68. Jacob S. Phosphotransfer Protein Ypd1p is Essential for Fludioxonil Action in Phytopathogenic Fungi. Fungal Genom Biol. 2016;6:140.
69. Rajashekar Y and Tonsing N. The Herbal Insecticides from Root Stock of Alocasia indica as Potential Sources for Control of Stored- Product Insect Pests. Entomol Ornithol Herpetol. 2014;3:128.
70. Elazhari M, et al. Prevalence and Distribution of Superantigen Toxin Genes in Clinical Community Isolates of Staphylococcus Aureus. J Bacteriol Parasitol. 2011;2:107.
71. Niculescu VF. Pathogenicity of Entamoeba Species Depends on Cell Line Conversion, Genome Reprogramming and Epigenetic Gene Regulation. J Cell Sci Ther. 2016;7:245.

72. Wahlroos T and Susi P. Differential Effects of Viral Coat Protein on Induction of Hypersensitive Response and Systemic Movement of Tobacco Mosaic Virus and Tobacco Mild Green Mosaic Virus in Nicotiana megalosiphon. J Plant Pathol Microb. 2015;6:252.
73. Tamang D, et al. Effect of Herbicide Application on Weed Management in Green Gram [Vigna radiata (L.) Wilczek]. Adv Crop Sci Tech.2015;3:163.
74. Kalampokas T, et al. Vitamin A Deficiency and Female Fertility Problems: A Case Report and Mini Review of the Literature. J Women's Health Care. 2014;3:210.
75. Al-irr KI. Transient Cortical Blindness Following Coronary Angiography. J Clin Exp Cardiolog. 2016;7:435.
76. Krishnakumar BM and Selvan KM. Further Notes on Breeding Habits of Indian Bridal Snake Dryocalamus nympha (Daudin, 1803) from Coromandel Coastal Plains, South India. Entomol Ornithol Herpetol. 2016;5:e120.
77. Diop MB, et al. Efficiency of Neutralized Antibacterial Culture Supernatant from Bacteriocinogenic Lactic Acid Bacteria Supplemented With Salt in Control of Microorganisms Present in Senegalese Artisanally Handled Fish by Immersion Preservative Technology During Guedj Seafood Processing at 10°C and 30°C. J Food Microbiol Saf Hyg. 2016;1:102.
78. Shabir HW, et al. Transgenic Rice: Advancements and Achievements. Adv Genet Eng. 2015;4:133.
79. Das RN and Sarkar PK. Lifestyle Characteristics and Dietary impact on Plasma Concentrations of Beta-carotene and Retinol. Biodiscovery. 2012;3:3.
80. Shrestha S. Assessment of Water Availability under Climate Change Scenarios in Thailand. J Earth Sci Clim Change. 2014;5:184.
81. Starkey CE, et al. Use of Hppd-inhibiting Herbicides for Control of Troublesome Weeds in the Midsouthern United States. Adv Crop Sci Tech. 2016;4:205.
82. Shanmugaraj BM and Ramalingam SK. Plants as an Alternate System for the Large Scale Production of Recombinant Therapeutic Proteins. Biochem Anal Biochem. 2014;3:i101.
83. Tsai CC, et al. An in vitro Investigation of the Antagonistic Effects of Multiple Strains of Lactobacillales on Salmonella Enterica Serovar Choleraesuis. Appli Micro Open Access. 2016;2:109.
84. Vadakedath S and Kandi V. DNA Methylation and Its Effect on Various Cancers: An Overview. J Mol Biomark Diagn. 2016;S2:017.
85. Gohil D, et al. Oseltamivir Resistant Influenza A (H1N1) Virus Infection in Mumbai, India. J Antivir Antiretrovir. 2015;7:108-114.
86. Rosa LS, Silva NJA, Soares NCP, Monteiro MC, Teodoro AJ (2016) Anticancer Properties of Phenolic Acids in Colon Cancer – A Review. J Nutr Food Sci 6:468.
87. Giri P and Kulkarni R. Cardiac Resynchronization Therapy-Anesthetic Considerations. J Anesth Clin Res. 2016;7:643.
88. Arumugham V. Evidence that Food Proteins in Vaccines Cause the Development of Food Allergies and Its Implications for Vaccine Policy. J Develop Drugs. 2015;4:137.
89. Chadha V. Antibiotic Resistant Genes in Natural Environment. Agrotechnol. 2012;1:104.
90. Yadav H, et al. Gut Microbiome Derived Metabolites to Regulate Energy Homeostasis: How Microbiome Talks to Host. Metabolomics. 2016;6:e150.

91. Sayed AEDH. Evaluation of Apoptotic Cell Death and Genotoxicty Following Exposure to Silver Nanoparticles in African Catfish (Clarias gariepinus). Toxicol open access. 2016;2:109.
92. Amare T, et al. Productivity, Yield Attributes and Weed Control in Wheat (Triticum aestivum L.) as Influenced by Integrated Weed Management in Central High Lands of Ethiopia, East Africa. Adv Crop Sci Tech. 2016;4:206.
93. Jahanzeb M, et al. Exploring the Nutritional Quality Improvement in Cereal Bars Incorporated with Pulp of Guava Cultivars. J Food Process Technol. 2016;7:567.
94. Berger-Doyle J, et al. Planting Date, Irrigation, and Row Spacing Effects on Agronomic Traits of Food-grade Soybean. Adv Crop Sci Tech. 2014;2:149.
95. Jai S Ghosh. Solid State Fermentation and Food Processing: A Short Review. J Nutr Food Sci. 2015;6:453.
96. Abuloye AP and Moruff GA. Climate Variability and Extreme Climate Events: Rural Women Farmers' Perception in Southwest Nigeria. J Geogr Nat Disast. 2016;6:166.
97. Shabani A. A review of Anticancer Properties of Herbal Medicines. J Pharma Care Health Sys. 2016;3:160.
98. Menaa F. Genetic Engineering and Nanotechnology: When Science-Fiction Meets Reality! Adv Genet Eng. 2015;4:128.
99. Lewis Liu Z and Wang X. A Reference Model System of Industrial Yeast Saccharomyces cerevisiae is needed for Development of the Next-Generation Biocatalyst toward Advanced Biofuels Production. J Microb Biochem Technol. 2015;7:e125.
100. Haron H and Raob N. Changes in Macronutrient, Total Phenolic and Anti-Nutrient Contents during Preparation of Tempeh. J Nutr Food Sci. 2014;4:265.