The Impact of Biotechnology on the Global Flower Industry

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The world cutflower market is both very large and highly globalised. The developed countries have traditionally accounted for most consumption with the three largest markets of Germany Japan and the USA being worth at least US$ 3–5 billion per annum each at the retail level. Production ocurs world-wide, subject to suitable climate, labour costs and efficient air freighting services.

Transformation of all the major cutflower crops is now routine and with the rapid increase in availability of cloned genes it is likely that the flower industry will derive many benefits from the advent of gene technology-based breeding.

Gene technology is being used to impact traits that are valued both by flower producers and flower consumers. Flower growers are reliant and agrichemicals to control pests and diseases, but increasingly must satisfy their customers' preference for 'green' products. In addition to an increasing pressure to minimise the use of chemicals in production, flower consumers are also demanding both high quality and novel products.

Florigene is an Australian company using gene technology to develop new varieties of cutflowers that will be valued by both producers and consumers.

The company is well advanced with the development and commercialisation of new cutflower varieties that are targeted to flower consumers e.g. new colours and improved vase-life, but also continues to evaluate the potential 'resistance' technologies to impact cutflower production.

Plant Roots, Environmental Remediation and Biochemical Manufacturing

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Plant roots hold a large potential for environmental remediation and bio-manufacturing. Recently developed phytoremediation technology exploits the innate ability of plants to concentrate, degrade or immobilize environmental pollutants in soils and waters. Two subsets of phytoremediation, which use plant roots to efficiently absorb and transport toxic heavy metals are approaching commercialization: (I) Phytoextraction, in which specially selected high biomass metal-accumulating plants and appropriate soil amendments are used to transport and concentrate metals from the soil into above-ground shoots which are subsequently harvested and (II) Rhizofiltration, in which roots of hydroponically grown plants, precipitate and concentrate toxic metals from polluted effluents. The metals targeted for phytoremediation include lead, cadmium, chromium, arsenic and various radionuclides. Progress has been made in understanding the biological mechanisms of phytoremediation and metal uptake, accumulation and resistance in plants. Genetic approaches which improve phytoremediation of metals have also been developed. Roots can also reduce valuable compounds and secrete them into the environment, in a process termed rhyzosecretion. Chemical and physical treatments, which mimic various stresses encountered by a plant, stimulate roots to produce and exude arrays of new compounds. Different plant species constantly synthesize and exude unique compounds whose chemical composition or function has never been determined. Secreted compounds may include valuable natural products and proteins, both native and transgenic. As one of the applications of rhizosecretion technology, tobacco roots were engineered to produce and continuously secrete several heterologous recombinant proteins. In all cases rhizosecretion did not alter the biological activity of the recombinant protein recovered from the hydroponic medium. The yield of a single plant product produced via rhizosecretion over time may exceed the weight of the plant producing it. In addition, the purification of individual compounds or proteins produced via rhizosecretion is a relatively simple task compared to tissue extraction methods.