PERSPECTIVE

Specialized metabolites and important molecules in medicinal and crop plants: The evolution of their use and production methods

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Rahnemoon A. Specialized metabolites and important molecules in medicinal and crop plants: The evolution of their use and production Methods. App Food Sci J 2023;7(1):1-2.

ABSTRACT

We use the enormous array of chemicals that plants naturally make to enhance our general wellbeing. And green factories are plants. In fact, they might be used to biosynthesize bioactive compounds, proteins, sugars, and biopolymers for scalable, sustainable manufacturing. These compounds are readily transformed into products for many industrial processes, including medications, antioxidants, food, feed, and biofuels. New discoveries in plant genetics, biotechnology, and metabolism secure and broaden the use of chemicals originating from plants in a variety of industrial fields.

Keywords: Bioactive compounds; Genomics; Metabolomics; Genome editing; Medicinal plants; Plant natural products; Plant biotechnology; Bio fortification

INTRODUCTION

Numerous environmental, economic, and social issues are now plaguing the planet. Ageing populations, pollution, pandemics, climate change, soil desertification, and severe resource depletion are driving business and public research to find creative solutions to ensure future health and safety. The common research policy encourages the use of renewable resources and environmentally friendly industrial processes in order to preserve natural resources. In this situation, plants are a key remedy. For instance, plant derived products are used to increase the nutritional value of food by adding nutritious nutrients. They may also be used as dietary supplements to support a balanced diet by offering vitamins, antioxidants, and fiber. It has been demonstrated that consuming bio fortified foods and drinks every day can help prevent a number of non-communicable illnesses, including diabetes, cancer, cardiovascular disease, and neurodegenerative disorders. The value of the so-called "functional foods" on the worldwide market is predicted by Guine et al. to reach USD 300 billion in 2020 as a result of the realization of the significance of food in healthcare, whose benefit extends beyond its nutritional content. Regional regulatory organizations support research initiatives to find novel phytochemicals, also from underused plants, that may be used to create novel nutraceuticals or functional meals. Undoubtedly, chemicals produced from plants serve as a major source of inspiration for the pharmaceutical industry.

DESCRIPTION

In the latter half of the 20th century, Western medicine became more interested in plant based specialized metabolites, particularly for those substances like atropine, codeine, digoxin, morphine, quinine, paclitaxel, and vincristine that are still used as optional medications to treat a variety of illnesses. Around 90% of the therapeutic plants used in Europe are derived from wild resources, and over 70% of the 1562 authorized medications with natural origins were introduced between 1981 and 2014. Recent studies are Newman and Crag, 2020. Found that 929 of the 1881 newly authorized medications during the past 40 years have a natural origin and 952 additional pharmaceuticals though they are categorized as synthetic either contain natural pharmacophores or compounds that mirror natural products. With a Compound Annual Growth Rate (CAGR) of 6.1% from 2017 to 2022, industry forecasts show that the global market for botanical and plant derived pharmaceuticals will increase from USD 29.4 billion in 2017 to about USD 39.6 billion by 2022. However, there is a potential ecological concern associated with the rising demand for bioactive compounds made from plants. It may result in an overuse of plant resources, which would eventually reduce biodiversity. There are a number of ways to get around this significant limitation.

Priorities for biodiversity protection include *in situ* and *ex situ* conservation, domestication of wild species, botanical garden preservation, and bank seed storage. We were particularly drawn to the approach put out by certain writers, which called for the immediate replacement of lignocellulose and biomass species (such as Mischantus, poplar, and willow) with orphan crops or wild relatives of farmed crops (designated as third generation crops). Since these later species are increasingly being grown in large monoculture, there are worries regarding their effects on biodiversity. The aforementioned suggested approach could offer the chance to reintroduce a number of wild species, which are more tolerant of climate change than crops and can also be used for other human purposes. To get over this significant limitation, several options might be explored. The domestication of wild species, preservation through botanical gardens, and bank seeds preservation are essential concerns for biodiversity protection. To directly replace lignocellulose and biomass species (such as Mischantus, poplar, and willow), some writers have suggested cultivating orphan crops or wild relatives of domesticated crops (designated as third generation crops). Due to their increased cultivation in vast monocultures, these later species raise questions regarding their effects on biodiversity. The aforementioned suggested remedy may present a chance to reintroduce a number of wild species, which are more climate robust than crops and may also be utilized for other human requirements. The introduction of high throughput approaches in all 'omits' disciplines over the past 10 years has made it possible to decrease the number of samples and the time required for extensive screening studies, helping to limit the over-exploitation of plant resources. The addition of new information from sequencing and transcriptase data on the genes and enzymes in charge of a particular metabolite's production supported plant selection, marker assisted breeding for desirable characteristics, and even the use of heterologous systems to produce target compounds. Long before recorded history, phytochemicals were employed in ancient human treatment. They served as horrific poisons to commemorate enigmatic historical events as well as colours for crafts and cosmetics, smells for rituals, and coloring for handicrafts. Plant features defined by phytochemicals formed the basis for even the earliest systematic grouping attempts.

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Received: *31-Aug-2022, Manuscript No. PULAFSJ-22-5502;* ***Editor assigned:*** *02-Sep-2022, PreQC No. PULAFSJ-22-5502 (PQ);* ***Reviewed:*** *16-Sep-2022, QC No.PULAFSJ-22-5502;* ***Revised:*** *09-Jan-2023, Manuscript No. PULAFSJ-22-5502 (R);* ***Published:*** *17-Jan-2023, DOI: 10.37532/PULAFSJ.23.7(1).1-2*

CONCLUSION

Prior to the revolutionary works of Linnaeus and species plant arum, people and even naturalists suggested how to group herbals using characteristics like savouriness, spiciness, along with medical and artisanal uses (examples are in work De Material Medical of Discords, 1st century A.D., and Theatre Botanical of Parkinson, 1640). This anthropocentric viewpoint is clearly articulated by Paracelsus' (1493–1541) conviction that god revealed to humanity through the morphology of plant organs the proper therapeutic uses of plant substances.