

PREFACE

Recent Advances in Plant Research begins by providing a summary of work performed on the effects of environmental factors and growth treatments on secondary metabolite production in both conventionally and *in vitro* cultivated plant material, focusing on different classes of volatile and non-volatile secondary metabolites.

Following this, the authors set out to determine the diversity of *Fabaceae* in vegetational fragments of Cerrado in the state of Maranhão. Monthly expeditions were carried out in the period between September 2016 and June 2017 for the observation, collection, and identification of botanical material.

The great potential of the most important by-products of apples, grapes and berry fruits processing as a source of antioxidants is presented in one chapter. Some novel and practical aspects of extraction of natural antioxidants are also discussed.

Also discussed is gray mold rot caused by *Botrytis cinerea* Persoon: Fries [teleomorph *Botryotinia fuckeliana* (de Bary) Whetzel]. It is a serious disease causing severe damage to fruits and vegetables at both pre- and post-harvest periods. The authors aim to highlight try to highlight the disease distribution and hosts range, pathogenesis of the pathogen, symptoms of the disease, disease cycle and epidemiology of the pathogen as well as the current status of the disease in Malaysia.

Plants produce an array of toxins and defensive proteins through various metabolic pathways for their defence against insects. To cope with these defences, herbivores have developed counter-defences which the authors examine in this compilation. Furthermore, insects have employed a diverse array of strategies that enable them to bypass defensive barriers, or to metabolise these chemicals after ingestion.

Next, angiosperm flowers that have been found in mid-Cretaceous Myanmar (Burmese) amber are analyzed. Flowers in amber often show details of their reproductive parts that are not evident in blooms preserved in sedimentary deposits. Two new genera are described, *Chenocybus allodapus* gen et sp. nov. and *Diaphoranthus burmensis* gen et sp. nov.

Japan, which extends north and south, has four clearly defined seasons that provide a variety of unique habitats for the growth of various aromatic and medicinal plants. Recent focus on these traditional plants has begun to revitalize local communities, providing diversification to alternative medicines and the development of other products, as well as suggesting increased use of plants.

Aiming to better understand the phytodiversity of a vegetation area in the Piauí state, Brazil, in addition to aspects such as the geographical distribution of species and their uses, the concluding study was carried out in municipality of Bom Princípio, northern Piauí. The diverse flora was represented by trees, shrubs and herbaceous species, distributed in 54 families, 114 genera, and 146 species.

Chapter 1 - Secondary metabolites production, accumulation and translocation are dependent on the presence of highly specialized anatomical structures within the plant organism. Therefore secondary metabolites content is strongly affected by the developmental patterns and morphogenesis of the plant individual.

The present chapter summarizes work performed on the effects of environmental factors and growth treatments on secondary metabolite production in both conventionally and *in vitro* cultivated plant material. Different classes of volatile and non-volatile secondary metabolites have been concerned.

The author's own experience in the impact of tissue culture treatments on the developmental patterns and morphological features *in vitro* and the subsequent modification of secondary metabolite production of species of the genera *Hypericum*, *Sideritis* and *Artemisia* have been summarized and discussed.

Chapter 2 - *Fabaceae* is one of the largest families among the angiosperms, with representatives widely distributed throughout the globe, where 770 genera and 19.500 species are recognized and divided into six subfamilies (*Caesalpinioideae*, *Cercidoideae*, *Detarioideae*, *Dialioideae*, *Duparquetioideae*, and *Papilionoideae*). Floristic and taxonomic works indicate *Fabaceae* as the largest species family in Brazil and most representative in forest formations. The Cerrado has a significant representation of the family, where the state of Maranhão covers a broad area. In this way, the research had as goal to know the diversity of *Fabaceae* in vegetational fragments of Cerrado in the state of Maranhão. Monthly expeditions were carried out in the period between September 2016 and June 2017 for observation, collection, and identification of botanical material. The Cerrado area sampled belongs to the municipality of São João do Sóter, in the Maranhense's East. After the collections, the specimens were herborized, analyzed with the help of taxonomic keys, specialized literature for identification, and determined by area expert. A total of 68 specimens, 31 genera, and 45 species were cataloged. Of all the specimens collected, the subfamilies *Papilionoideae* and *Caesalpinioideae* were the most representative of 21 species each. As for the Life form, was observed that the prevailing growth habit was the shrub type (20). Concerning to the physiognomies of the Cerrado, was observed the predominance of the species in the gallery forest environment (28).

Were obtained three new records to the Maranhão, the species: *Desmodium subsecundum* Vogel. *Aeschynomene viscidula* Michx and *Vigna lasiocarpa* (Mart. ex Benth.) Verdc. being *V. lasiocarpa* a new record for the Northeast region of Brazil. Taxonomic keys, descriptions and photo plates were elaborated with all the studied species, composing a taxonomic treatment. In this way, it can be established that the Cerrado of Maranhão possesses a diversity of species for the *Fabaceae* family and that the research carried out has provided a basis for later studies, since these are few for Maranhão.

Chapter 3 - The awareness of consumers regarding the functional food led to an increasing demand for functional foods especially for foods rich in antioxidants, which have a wide range of activities such as antitumoral, antiviral, cardioprotective and antimutagenic activities. Phenolic compounds are an essential part of the human diet and are of considerable interest due to their antioxidant activities. Wastes from fruits represent a major disposal problem for the industry concerned. The by-products, which are results of the fruit processing, are rich in valuable compounds and represent a novel, natural and economic sources of flavorings, colorants, polyphenols and natural antioxidants, which can be used in the food industry as a source of natural food additives. This chapter is underlying the great potential of the most important by-products of apples, grapes and berry fruits processing as a source of antioxidants. Some novel and practical aspects of extraction of natural antioxidants will be discussed in this chapter.

Chapter 4 - The gray mold rot is caused by *Botrytis cinerea* Persoon: Fries [teleomorph *Botryotinia fuckeliana* (de Bary) Whetzel]. It is a serious disease causing severe damages on fruits and vegetables at both pre and post-harvest periods. *Botrytis cinerea* is an ascomycetous fungus as well as a necrotrophic plant pathogen that was ranked second in the top 10 most devastating fungal plant pathogens worldwide. Due to its broad host range, the fungus infects more than 200 plant species of agricultural importance such as cucumbers, strawberries, grapes, tomatoes, cut flowers and ornamental plants. The fungus occurs mostly where its host plants are cultivated, under climatic conditions ranging from cool temperate zones to subtropical regions. The fungus is highly concentrated in the temperate areas between latitudes 25 and 30. In Malaysia, the occurrence of this disease has been widespread in the greenhouses of the commercial farms in the Cameron Highland area of Pahang, Malaysia. This hindered the growing industries, hence detection, and characterization of the pathogen using molecular approaches provide an essential tool for establishing disease management programs. Since the pathogen is highly destructive, in this book chapter the authors will try to highlight the disease distribution and hosts range, pathogenesis of the pathogen (*B. cinerea*), symptoms of the disease, disease cycle and epidemiology of the pathogen (*B. cinerea*) as well as the current status of the disease (gray mold rot) in Malaysia.

Chapter 5 - Insect herbivores use different feeding strategies to obtain nutrients and energy from plants for their growth and reproduction. Plants produce an array of toxins and defensive proteins through various metabolic pathways for their defence against

insects. To cope with these defences, herbivores have developed counter defences. These responses of insect herbivores are important in insect plant interactions. Among these interactions, host plant selection and feeding behaviour are important factors and play a significant role in habitat selection and discrimination mechanisms between host species. Furthermore, insects have employed a diverse array of strategies that enable them to bypass defensive barriers, or to metabolise these chemicals after ingestion.

Chapter 6 - Amberization is a unique type of fossilization that preserves both animal and plant parts for millions of years through a unique fixation-dehydration process. Flowers in amber often show details of their reproductive parts that are not evident in blooms preserved in sedimentary deposits. The present chapter discusses angiosperm flowers that have been found in mid-Cretaceous Myanmar (Burmese) amber. Two new genera are described, *Chenocybus allodapus* gen et sp. nov. and *Diaphoranthus burmensis* gen et sp. nov. These two new genera, along with other flowers described from this amber source, namely, *Antiquifloris latifibris*, *Cascolaurus burmitis*, *Endobenthos paleosum*, *Eopigynia burmensis*, *Jamesrosea burmensis*, *Lachnociona terriae*, *Micropetasos burmensis*, *Palaeoanthella huangii*, *Programinis burmitis*, *Programinis laminatus*, *Tropidogyne pikei* and *Tropidogyne pentaptera*, are considered extinct at the generic level. However, the level of extinction of the various lineages varies and they can be arranged in roughly three groups. Group one consists of flowers with no obvious affinities to any extant lineages. Group 2 are flowers with possible affinities to extant lineages above the family level. Group 3 are flowers that can be placed in extant families. Comments on possible pollinators in the Myanmar amber forest and extinction events regarding Myanmar amber flowers are included.

Chapter 7 - Japan, which extends north and south, has four clearly defined seasons that provide a variety of unique habitats for the growth of various aromatic and medicinal plants. Recent focus on these traditional plants has begun to revitalize local communities, providing diversification to alternative medicines and the development of other products. Aromatic plants are widely used in Japanese foods such as Washoku, the cuisine of Japan, which is recognized on the UNESCO Heritage list. The traditional Japanese "Kodo" (an elegant incense ceremony) uses several aromatic plants that provide graceful aromas. Indigenous aromatic and medicinal plants continue the connection of plants with life and with spirit for the Japanese. Due to global warming, a change may limit plant growth and alter constituents, endangering both domestic and wild species. Thus, conservation of genetic resources is necessary to insure that the unique aromatic plant species of Japan, such as *Eutrema japonicum* (Wasabi) and *Cryptomeria japonica* (Sugi), are maintained. While universities, companies, institutes, and homes own a number of gardens and conservatories, the most important concerns are the use, conservation, and return of natural resources in a daily life. Various locations in Japan practice a circulation-type forestry. This method creates new jobs that eventually lead to regional revitalization. Recently, the introduction of profiles and advantages of domestic Japanese

medicinal and aromatic plants have developed markets with remarkable growth in Japan, suggesting increased interest and use of plants for better health, education, and environment in Japan.

Chapter 8 - Aiming to better understand the phytodiversity of a vegetation area in the Piauí state, Brazil, in addition to aspects such as the geographical distribution of species and their uses, this study was carried out in municipality of Bom Princípio, northern Piauí. The diverse flora was represented by trees, shrubs and herbaceous species, distributed in 54 families, 114 genera, and 146 species. The families of richest genera were *Fabaceae* (22 genera), followed by *Malvaceae* and *Rubiaceae* (seven genera) and *Poaceae* (five genera). Approximately 64,81% (35) of families were represented by a single genus at this location. It was found, according to the literature, that 29 species belonging to 16 families have economic potential. Most species have medicinal potential, with 22 species; followed by 15 timber species, with 14 honey producer species; 12 ornamental species, food with eight species, forage nine and use for fuel, eight species. Of the species recorded in area 97 (66.4%) are not endemic in Brazil and 47 (32,2%) are endemic in this country. As consultations held in the collections of several Virtual Herbarium and Herbarium "HDelta," checked that 17 species did not have occurrence records in Piauí state. Analyzing the geographical distribution of species recorded in the study area and comparing with other surveys, it was found that 13 species found in survey's "cerrado" vegetation and 18 species in "caatinga" vegetation areas. The floristic survey in this semideciduous vegetation area in northern Piauí showed that in the area there are a number of species belonging to the plant formations of "cerrado" and "caatinga" vegetation, according to data of floristic lists made these vegetational formations, thus suggesting, treat itself to a transition area between these two types of vegetation.