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Exploring natural products-based cancer therapeutics derived from egyptian flora
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Abstract
Ethnopharmacological relevance: Egyptian plants are a rich source of natural molecules, representing considerable biodiversity due to climate variations between the Northern, Southern, Eastern and Western regions of the country. Sinai is considered a precious nature reserves preserving flora, fauna, marine organisms, and historical habitats with ancient origins. Here, traditional medicinal approaches have been used for hundreds of years. Healthy lifestyles, low levels of stress and microbial infections, and a dependence on flora and herbal medicine might in combination explain why the burden of cancer is lower in some regions than in others. Aim of the study: The primary aim of this review is to document the plants and natural products that are used as foods and medicines in Egypt, in general, and in Sinai, in particular, with a focus on those with demonstrated anticancer activities. The documented traditional uses of these plants are described, together with their chemical and pharmacological activities and the reported outcomes of clinical trials against cancer. Materials and methods: A literature search was performed to identify texts describing the medicinal plants that are cultivated and grown in Egypt, including information found in textbooks, published articles, the plant list website (http://www.theplantlist.org/), the medicinal plant names services website (http://mpns.kew.org/mpns-portal/), and web databases (PubMed, Science Direct, and Google Scholar). Results and discussion: We collected data for most of the plants cultivated or grown in Egypt that have been previously investigated for anticancer effects and reported their identified bioactive elements. Several plant species, belonging to different families and associated with 67 bioactive compounds, were investigated as potential anticancer agents (in vitro studies). The most potent cytotoxic activities were identified for the families Asteraceae, Lamiaceae, Chenopodiaceae, Apocynaceae, Asclepiadaceae, Euphorbiaceae, Gramineae, and Liliaceae. The anticancer activities of some species, such as Punica granatum L., Nerium oleander L., Olea europea L., Matricaria chamomilla L., Cassia acutifolia L., Nigella sativa L., Capsicum frutescens L., Withania somnifera L., and Zingiber officinale Roscoe, have been examined in clinical trials. Among the various Egyptian plant habitats, we found that most of these plants are grown in the North Sinai, New-Delta, and Giza Governorates. Conclusion: In this review, we highlight the role played by Egyptian flora in current medicinal therapies and the possibility that these plants may be examined in further studies for the development of anticancer drugs. These bioactive plant extracts form the basis for the isolation of phytochemicals with demonstrated anticancer activities. Some active components derived from these plants have been applied to preclinical and clinical

settings, including resveratrol, quercetin, isoquercetin, and rutin. © 2020 Elsevier B.V.

Author Keywords
3,7- Dimethylether quercetin (PubChem CID: 5280417; Anticancer; Apigenin (PubChem CID: 5280443); Apigenin-7-O-β-D-glucopyranoside (PubChem CID: 5280704); Arjunin (PubChem CID: 102316370); Bioactive natural compounds; Centaureidin (PubChem CID: 5315773); Chrysin (PubChem CID: 5281607); Chrysosplenetin (PubChem CID: 5281608); Clinical trials; E/Z acteoside (PubChem CID: 5281800); Egyptian medicinal plants; Ethnomedicine; Eupafolin (PubChem CID: 5317284); Ferutinin (PubChem CID: 91747167); Glabratephrin (PubChem CID: 12893624); Isorhamnetin-7-O-β-glucoside (PubChem CID: 6455477); Kaempferol (PubChem CID: 5280863); Kaempferol-3-O-rutinoside (PubChem CID: 122173234); Khellin (PubChem CID: 3828); Lucenin (PubChem CID: 442615); Luteolin 6,8-di-C-β glucopyranoside (lucenin 1) (PubChem CID: 44257923); Neopulchellin (PubChem CID: 366039); Oleanolic acid (PubChem CID: 10494); Orientin (PubChem CID: 5281675); Proscillaridin A (PubChem CID: 222154); Pseudosemiglabrin (PubChem CID: 10408186); Quercetin (PubChem CID: 5280343); Quercetin 7-O-β-glucopyranoside (PubChem CID: 5381351); Quercetin-3-O-α-L- rhamnoside (Quercetrin) (PubChem CID: 5280459); Quercetin-3-O-β-D-glucopyranoside (PubChem CID: 12304324); Quercetin-3-O-β-glucoside (PubChem CID: 44259136); Rutin (PubChem CID: 5280805); Stigmasterol (PubChem CID: 5280794); Taraxasterol (PubChem CID: 441686); Ursolic acid (PubChem CID: 64945); α-Amyrin (PubChem CID: 73170); β-Sitosterol (PubChem CID: 222284); β-Sitosterol-3-O-β-D-glucoside (PubChem CID: 70699351)

Index Keywords
acetic acid ethyl ester, alcohol, Allium artemisietorum extract, Alstonia scholaris extract, Amaranthus spinosus extract, Ammi majus extract, Ammi visnaga extract, Anabasis setifera extract, Annona cherimola extract, antineoplastic agent, Artemisia monosperma extract, Asclepias sinaica extract, Asparagus stipularis extract, Asphodelus ramosus extract, Atriplex semibacata extract, Avena fatua extract, Avicennia marina extract, Balanites aegyptiaca extract, Ballota undulate extract, Beta vulgaris extract, Bidens pilosa extract, Buddleja asiatica extract, Calotropis gigantea extract, Calotropis procera extract, Capsicum frutescens extract, Cassia acutifolia extract, Cassia glauca extract, Catharanthus roseus extract, Caylusea hexagyna extract, Chenopodium ambrosioides extract, Chiliadenus montanus extract, chloroform, Cichorium endivia extract, Citrus reticulate extract, Colocasia antiquorum extract, Convolvulus arvensis extract, Conyza bonariensis extract, Conyza dioscoridis extract, Cotoneaster horizontalis extract, Cucurbita pepo extract, Deverra triradiata extract, dichloromethane, Diplotaxis harra extract, Dodonaea viscosa extract, doxorubicin, Eichhornia crassipes extract, Ephedra pachyclada extract, Erucaria hispanica extract, essential oil, Eucalyptus sideroxylon extract, Euphorbia peplus extract, Euphorbia prostrata extract, Euphorbia pulcherrima extract, Fagonia arabica extract, Ferula hermonis extract, Ficus bengalensis extract, Foeniculum vulgare extract, Gaillardia aristata extract, ginger extract, Globularia arabica extract, hot water, Hyphaene thebaica extract, Ipomoea cairica extract, isoquercetin, Jasonia montana extract, Juniperus phoenicea extract, Kickxia aegyptiaca extract, Leptadenia pyrotechnica extract, Luffa aegyptiaca extract, Marjorana hortensis extract, Matricaria chamomilla extract, Matricaria recutita extract, Melia azedarach extract, Mentha longifolia extract, methanol, Mimusops laurifolia extract, natural product, Nauplius graveolens extract, Nerium oleander extract, Nigella sativa extract, Ocimum basilicum extract, Origanum majorana extract, Oxalis corniculata extract, Pancratium maritimum extract, Pelargonium graveolens extract, Persea americana extract, Philodendron bipinnatifidum extract, plant extract, Plectranthus amboinicus extract, Poa annua extract, Polypogon monspeliensis extract, Polypogon semi verticellata extract, Portulaca oleracea extract, Pteranthus dichotomus extract, Pulicaria undulate extract, quercetin, Reseda arabica extract, Reseda ducrsiva extract, Reseda muricata extract, Reseda pruinosa extract, resveratrol, Ricinus communis extract, Rumex dentatus extract, rutoside, Salvadora persica extract, Salvia aegyptiaca extract, Sapindus saponaria extract, Scrophularia marilandica extract, Senecio reflexum extract, Sesbania sesban extract, Sisymbrium trio extract, Solenostemma arghel extract, Solonum nigrum extract, Sonchus oleraceus extract, Terminalia arjuna bark extract, Tribulus macropterus extract, Trifolium resupinatum extract, unclassified drug, Urginea maritima extract, Withania somnifera extract, antineoplastic agent, biological product; Allium, Allium artemisietorum, Alstonia scholaris, Amaranthaceae, Amaryllidaceae, Ammi majus, Ammi visnaga, Anabasis (plant), Anabasis setifera, animal cell, Annona cherimola, antineoplastic activity, Apocynaceae, Arecaceae, Artemisia monosperma, Asclepias sinaica, asparagus, Asparagus stipularis, Asphodelus ramosus, Asteraceae, Atriplex, Atriplex semibacata, Avena fatua, Avicennia marina, avocado, Balanites aegyptiaca, Ballota, Ballota undulate, bark, basil, Bidens pilosa, black cumin, Brassicaceae, breast cancer cell line, Buddleja asiatica, Calotropis procera, cancer incidence, cancer therapy, Capsicum frutescens, Caryophyllaceae, Cassia, Catharanthus roseus, Caylusea hexagyna, Chenopodium ambrosioides, Chiliadenus montanus, Citrus, Citrus reticulate, clinical trial (topic), Colocasia, Colocasia antiquorum, colon cancer cell line, controlled study, Convolvulus arvensis, Conyza bonariensis, Conyza dioscoridis, Cotoneaster horizontalis, Cucurbita pepo, Deverra triradiata, Diplotaxis harra, Dodonaea viscosa, drug cytotoxicity, Egypt, Eichhornia crassipes, endive, Ephedra, Ephedra pachyclada, Erucaria hispanica, Eucalyptus, Euphorbia, Euphorbia peplus, Euphorbia prostrata, Euphorbia pulcherrima, Euphorbiaceae, Fabaceae, Fagonia arabica, female, fennel, Ferula, Ficus benghalensis, flora, flower, fruit, Gaillardia aristata, germander, ginger, Globularia arabica, human, human cell, Hyphaene thebaica, IC50, Ipomoea, Ipomoea cairica, Jasonia montana, Juniperus, Juniperus phoenicea, Kickxia aegyptiaca, Lamiaceae, Lavandula pubescens extract, lavender, Leptadenia pyrotechnica, leukemia cell, Liliaceae, liver cancer cell line, Luffa aegyptiaca, lung cancer cell line, lymphoma cell, male, maritime squill, marjoram, Marjorana hortensis, Matricaria chamomilla, Matricaria recutita, medicinal plant, Melia azedarach, Mentha longifolia, Mimusops laurifolia, mouse, Nerium oleander, nonhuman, olive tree, Oxalis corniculata, Pancratium maritimum, Pelargonium, Pelargonium graveolens, Philodendron, Philodendron bipinnatifidum, plant leaf, plant root, Plectranthus amboinicus, Poa annua, Poaceae, Polypogon monspeliensis, Polypogon semi verticellata, pomegranate, Portulaca oleracea, Pteranthus dichotomus, Pulicaria, Pulicaria undulate, Reseda arabica, Reseda ducrsiva, Reseda muricata, Reseda pruinosa, Review, Ricinus communis, Rumex dentatus, Salvadora persica, Salvia, Scrophularia, Scrophularia marilandica, Scrophulariaceae, Senecio, Senecio reflexum, Senna alexandrina, Sesbania, Sesbania sesban, shoot, Sisymbrium trio, Solenostemma arghel, Solonum nigrum, Sonchus oleraceus, Stachys, Stachys aegyptiaca, Terminalia arjuna, Teucrium leucocladum, traditional medicine, Tribulus

macropterus, Withania somnifera, Zygophyllaceae, animal, ethnology, isolation and purification, medicinal plant, neoplasm, phytotherapy, procedures; Animals, Antineoplastic Agents, Phytogenic, Biological Products, Egypt, Humans, Neoplasms, Phytotherapy, Plants, Medicinal

Chemicals/CAS

acetic acid ethyl ester, 141-78-6; alcohol, 64-17-5; chloroform, 67-66-3; dichloromethane, 75-09-2; doxorubicin, 23214-92-8, 25316-40-9; isoquercetin, 21637-25-2, 482-35-9; methanol, 67-56-1; quercetin, 117-39-5; resveratrol, 501-36-0; rutoside, 153-18-4, 22519-99-9; Antineoplastic Agents, Phytogenic; Biological Products

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