Plant Natural Sources of the Endocannabinoid (E)-β-Caryophyllene: A Systematic Quantitative Analysis of Published Literature

Massimo E. Maffei †

Department of Life Sciences and Systems Biology, University of Turin, Via Quarello 15/a, 10135 Turin, Italy; massimo.maffei@unito.it; Tel.: +39-011-670-5967
† This work is dedicated to Husnu Can Baser for his 70th birthday.

Received: 7 August 2020; Accepted: 4 September 2020; Published: 7 September 2020

Abstract: (E)-β-caryophyllene (BCP) is a natural sesquiterpene hydrocarbon present in hundreds of plant species. BCP possesses several important pharmacological activities, ranging from pain treatment to neurological and metabolic disorders. These are mainly due to its ability to interact with the cannabinoid receptor 2 (CB2) and the complete lack of interaction with the brain CB1. A systematic analysis of plant species with essential oils containing a BCP percentage > 10% provided almost 300 entries with species belonging to 51 families. The essential oils were found to be extracted from 13 plant parts and samples originated from 56 countries worldwide. Statistical analyses included the evaluation of variability in BCP% and yield% as well as the statistical linkage between families, plant parts and countries of origin by cluster analysis. Identified species were also grouped according to their presence in the Belfrit list. The survey evidences the importance of essential oil yield evaluation in support of the chemical analysis. The results provide a comprehensive picture of the species with the highest BCP and yield percentages.

Keywords: plant species; essential oil; yield; percentages of (E)-β-caryophyllene; Belfrit list; plant part; geographical origin

1. Introduction

The endogenous cannabinoid system (ECS) plays an important role in the immune response to an infection. At present, two cannabinoid (CB) receptors are described: cannabinoid type 1 receptor (CB1) and cannabinoid type 2 receptor (CB2), both G-protein coupled receptors [1]. The CB2 receptor represents the peripheral CB, due to its expression on circulating immune cells. However, studies have also found CB2 expression in the brain, such as cerebellum and microglial cells [2]. The CB2 receptor is involved in the attenuation of inflammatory immune responses. CB2 receptor pathway activation entails the suppression of cytokine release from immune cells and thereby dampening of the inflammatory response (immunosuppression) [3].

(E)-β-caryophyllene (BCP) is a bicyclic sesquiterpene hydrocarbon which is present in the essential oil of several plant species [4]. The Research Institute for Fragrance Materials (RIFM) evaluated BCP safety and the molecule has been approved by the Food and Drug Administration and by the European Food Safety Authority as a flavoring agent, which can be used in cosmetic and food additives [5]. Reports on oral sub-chronic toxicity support the safety of BCP for its proposed use also in medical food products [5]. BCP has been reported to be active against several disorders, with particular reference to cancer, chronic pain and inflammation [2]. Non-clinical BCP toxicity and an absence of adverse effects have been described [6]. Moreover, BCP can act as a selective agonist of CB2 [1], it activates peroxisome proliferator-activated receptor-α (PPAR α) [7] and has been recently involved in the prevention of
lipid accumulation and in the improvement of glucose uptake [8]. Therefore, BCP is a plant-derived bioactive molecule able to improve health and prevent lifestyle diseases. Moreover, the specificity of BCP for the CB2 receptor, mainly expressed in peripheral tissues, and its inability to bind CB1, which is predominantly expressed at the level of the central nervous system, implies that its action is devoid of the known psychoactive effects associated with the activation of CB1 [1,2,9,10]. In this context, BCP is an interesting alternative to the use of Cannabis.

Owing to the growing importance of BCP, it was interesting to evaluate the occurrence of this important endocannabinoid in plant species used for the extraction of essential oils. Therefore, the aim of this work was to look for plant natural sources of BCP in order to provide the pharmaceutical, nutraceutical and aroma industries a summary of plant species, parts used for extraction and geographical origin of plants producing BCP. Moreover, additional information was provided with regards to the content and yield of BCP as well as the occurrence of selected species in the Belfrit list [11], which includes botanicals allowed in food supplements and ensures compliance of botanicals in terms of quality and safety.

2. Results and Discussion

The database search (performed in July 2020) for the term caryophyllene provided 5867 entries. The search was then refined by selecting all papers with a chemical composition description. This selection provided 2604 entries, which were individually analyzed in order to select papers providing information on BCP percentage > 10%. Papers were then analyzed and the species binomial name, the plant family, the country of origin of samples and the plant part extracted were reported along with the BCP percentage and yield percentage. The total number of selected species was 295 (Table 1). Table 1 also lists the presence of the species in the Belfrit list [11].

In general, the 295 species belonged to 51 families and were reported from 56 countries worldwide. The essential oil containing BCP was extracted from 13 different plant parts. Out of 295 species, 34 were found to be listed in the Belfrit list, whereas for 51 species no data were available on the yield percentage. In many cases, the researchers used a small amount of plant parts (ranging from a few g to 200–300 g) from which it was impossible to evaluate the oil yield. However, in the majority of the other cases the yield was provided and hence reported (Table 1).
| Family          | Genus              | Species and Auth | Geogr. Origin of Sample | Belfrit List | Part Used | E.O. Yield% | BCP% | Code | Ref. |
|-----------------|--------------------|------------------|-------------------------|--------------|-----------|-------------|------|------|------|
| Anacardiaceae   | Rhus coriaria L.   | Iran             | YES fruits              |              | fruits    | 0.55        | 34.3 | 249  | [12] |
| Anacardiaceae   | Spondias pininata (Linn. F.) Kurz | Egypt | NO leaves              |              | leaves    | 2.00        | 49.9 | 268  | [13] |
| Annonaceae      | Annona densicoma Mart. | Benin             | YES leaves              |              | leaves    | 0.10        | 13.6 | 30   | [14] |
| Annonaceae      | Annona senegalensis Pers. | Burkina Faso | NO leaves              |              | leaves    | 0.73        | 19.1 | 32   | [16] |
| Annonaceae      | Artabotrys hexapetalus (L. f.) Bhundare | Vietnam | NO flowers              |              | flowers   | 0.94        | 11.4 | 38   | [18] |
| Annonaceae      | Cananga odorata (Lam.) Hook.f. and Thomson | Australia | YES leaves              |              | leaves    | 0.30        | 52.0 | 62   | [19] |
| Annonaceae      | Cleistopholis glauca Pierre ex Engler and Diels | Ivory Coast | NO leaves              |              | leaves    | 0.19        | 26.2 | 81   | [20] |
| Annonaceae      | Fissistigma rubiginosum Merr. | Vietnam | NO leaves              |              | leaves    | 0.30        | 28.1 | 125  | [21] |
| Annonaceae      | Goniothalamus multiovulatus Ast | Vietnam | NO stems              |              | stems     | 0.21        | 35.7 | 135  | [22] |
| Annonaceae      | Melodoron sp. (Dunal) Hook.f. and Thomson | Australia | NO leaf              |              | leaf      | 0.15        | 26.7 | 182  | [23] |
| Annonaceae      | Miliusa horsfeldii (Bennett) Baillon ex Pierre | Australia | NO leaves              |              | leaves    | 0.1         | 20.2 | 188  | [24] |
| Annonaceae      | Mitrephora zippeliana Miq. | Australia | NO leaves              |              | leaves    | 0.30        | 18.1 | 189  | [19] |
| Annonaceae      | Polyalthia oliveri Engl. | Ivory Coast | NO leaves              |              | leaves    | 0.13        | 31.4 | 237  | [25] |
| Annonaceae      | Pseuduvuaria hylandii Jessup | Australia | NO leaves              |              | leaves    | 0.50        | 24.1 | 242  | [26] |
| Annonaceae      | Uvariodendron calophyllum R. E. Fries | Cameroon | NO stem barks         |              | stem barks | 0.52       | 32.5 | 284  | [27] |
| Apiaceae        | Berula erecta (Hudson) Coville subsp. erecta | Serbia | NO aerial parts        |              | aerial parts | 0.01      | 14.9 | 52   | [28] |
| Apiaceae        | Bilacucaria anatolica A. Duran | Turkey | NO aerial parts        |              | aerial parts | 0.14      | 10.3 | 54   | [29] |
| Apiaceae        | Centella asiatica L. | South Africa | YES aerial parts      |              | aerial parts | 0.06      | 19.1 | 75   | [30] |
| Apiaceae        | Conium maculatum L. | Iran | NO aerial parts        |              | aerial parts | 0.20      | 15.3 | 85   | [31] |
| Apiaceae        | Dorema aucheri Boiss. | Iran | NO leaves              |              | leaves     | 0.40        | 35.7 | 108  | [32] |
| Apiaceae        | Eryngium vesiculosum Labill. | Australia | NO aerial parts n.a.  |              | aerial parts | 0.20      | 116  | 54   | [33] |
| Apiaceae        | Ferula glauca L. | Iran | NO leaves              |              | leaves     | 0.07        | 24.9 | 123  | [34] |
| Family    | Genus               | Species and Auth | Geogr. Origin of Sample | Belfrit List | Part Used   | E.O. Yield% | BCP%  | Code | Ref. |
|-----------|---------------------|------------------|-------------------------|--------------|-------------|-------------|-------|------|------|
| Apiaceae  | Grammosciadium      | pterocarpum Boiss. | Turkey                  | NO           | aerial parts | n.a.        | 15.3  | 136  | [35] |
| Apiaceae  | Hippomarathrum      | microcarpum (M. Bieb.) B. | Iran                   | NO           | aerial parts | 0.85        | 15.75 | 145  | [36] |
| Apiaceae  | Hippomarathrum      | boissieri Reuter et Hausskn | Turkey                 | NO           | aerial parts | 0.40        | 25.6  | 146  | [37] |
| Apiaceae  | Laser               | trilobum (L.) Borkh. | Iran                    | NO           | aerial parts | 1.80        | 22.4  | 165  | [38] |
| Apiaceae  | Oenanthe            | divaricata (R. Br.) Mabb. | Spain                  | NO           | aerial parts | 0.20        | 15.3  | 206  | [39] |
| Apiaceae  | Ostericum           | viridiflorum (Turcz.) | China                   | NO           | aerial parts | 0.03        | 24.3  | 210  | [40] |
| Apiaceae  | Pimpinella          | kotschyan Boiss. | Iran                    | NO           | seeds        | 5.16        | 49.9  | 224  | [41] |
| Apiaceae  | Prangos             | uloptera DC.      | Iran                    | NO           | aerial parts | 0.70        | 18.2  | 240  | [42] |
| Apiaceae  | Zosima              | absinthifolia Link | Iran                    | NO           | aerial parts | 0.20        | 22.2  | 295  | [43] |
| Apocynaceae | Allamanda          | cathartica L.     | Brazil                  | NO           | leaves       | 0.03        | 14.3  | 45   | [44] |
| Apocynaceae | Aspidosperma      | cylinodocarpum Muell. Arg. | Brazil                | NO           | leaves       | 0.30        | 56.9  | 272  | [45] |
| Apocynaceae | Tabernaemontana     | catharinensis A. DC. | Brazil                 | NO           | leaves       | 0.10        | 19.2  | 260  | [47] |
| Araliaceae | Schefflera          | stellata (Gaertn.) Harms | India                  | NO           | leaves       | 0.10        | 10.8  | 46   | [48] |
| Aristolochiaceae | Aristolochia     | elegans Mast.     | Argentina               | NO           | leaves       | 0.19        | 11.1  | 37   | [49] |
| Aristolochiaceae | Aristolochia      | fordiana Hemsl    | China                   | NO           | aerial parts | 0.10        | 17.6  | 4    | [50] |
| Asteraceae | Ageratum            | repens (L.)       | Iran                    | NO           | aerial parts | 0.11        | 10.0  | 6    | [52] |
| Asteraceae | Ageratum            | fastigiatus (Gardn.) R. M. King et H. Rob | Brazil             | NO           | branches     | 0.20        | 34.9  | 13   | [53] |
| Asteraceae | Ageratum            | congzioides L.    | Portugal                 | NO           | flowers      | 0.17        | 24.6  | 14   | [54] |
| Asteraceae | Anthemis            | alitissima L.     | Iran                    | NO           | flowers      | 0.03        | 25.3  | 34   | [55] |
| Asteraceae | Artemisia           | verlotorum Lamotte | France                  | YES          | aerial parts | 0.20        | 12.7  | 39   | [56] |
| Asteraceae | Artemisia           | pareflora Rosb    | India                   | NO           | aerial parts | 0.20        | 15.3  | 40   | [57] |
| Asteraceae | Artemisia           | purpurascens (Jacq.) Hook | India                 | NO           | aerial parts | 0.85        | 18.4  | 41   | [58] |
| Asteraceae | Artemisia           | capillator Thunb   | South Korea             | YES          | aerial parts | 0.46        | 13.4  | 43   | [59] |
| Asteraceae | Artemisia.          | stricta Edgew. f. stricta Pamp | India                 | NO           | aerial parts | 0.46        | 13.4  | 43   | [60] |
| Asteraceae | Artemisia.          | lavandulafolia DC | South Korea             | NO           | aerial parts | 0.02        | 10.8  | 46   | [62] |
| Family     | Genus                  | Species and Auth       | Geogr. Origin of Sample | Belfrit List | Part Used | E.O. Yield% | BCP% | Code | Ref. |
|------------|------------------------|------------------------|-------------------------|--------------|-----------|-------------|------|------|-----|
| Asteraceae | *Baccharis*            | *articulata* (Lam.) Pers | Argentina                | NO           | aerial parts | n.a.         | 16.8 | 48   | [63]|
| Asteraceae | *Bidens*               | *pilosa* L.            | Cameroon                 | NO           | leaves      | n.a.         | 27.1 | 53   | [64]|
| Asteraceae | *Centaura*             | *zlatiborensis* Zlatkovic, Novakovic and Janackovic | Serbia             | NO           | flowers      | n.a.         | 28.3 | 73   | [65]|
| Asteraceae | *Centaura*             | *appendicigera* C. Koch | Turkey                  | NO           | aerial parts | 0.18         | 17.5 | 74   | [66]|
| Asteraceae | *Centratherum*         | *punctatum* Cass       | Nigeria                  | NO           | leaves      | n.a.         | 16.6 | 76   | [67]|
| Asteraceae | *Chromolaena*          | *odorata* L.           | Togo                     | NO           | aerial parts | 0.50         | 25.2 | 78   | [68]|
| Asteraceae | *Conyza*               | *bonariensis* (L.) Cronquist | Brazil           | NO           | aerial parts | 0.20         | 14.4 | 87   | [69]|
| Asteraceae | *Cynanthis*            | *cinereum* (L.) H. Rob | Ivory Coast             | NO           | roots       | n.a.         | 17.0 | 100  | [70]|
| Asteraceae | *Dendranthema*         | *indicum* (L.) Des Moul. | China                  | NO           | aerial parts | 0.08         | 13.8 | 106  | [71]|
| Asteraceae | *Emilia*               | *sonchifolia* (L.) DC. | India                   | NO           | aerial parts | n.a.         | 22.7 | 110  | [72]|
| Asteraceae | *Epaltes*              | *alata* Steetz         | Niger                    | NO           | leaves      | 0.30         | 24.0 | 111  | [73]|
| Asteraceae | *Eriementhus*          | *erythropappus* (DC.) MacLeish | Brazil                | NO           | leaves      | 0.12         | 29.3 | 113  | [74]|
| Asteraceae | *Erigeron*             | *ramosus* (Walt.) B.S.P. | Korea                   | NO           | flowers      | 0.40         | 24.0 | 114  | [75]|
| Asteraceae | *Eriophalus*           | *luderitzianus* O.Hoffm. | South Africa           | NO           | aerial parts | 0.10         | 13.3 | 115  | [76]|
| Asteraceae | *Euaptorium*           | *triplinerve* Vahl     | India                   | NO           | leaves      | 0.40         | 14.7 | 120  | [77]|
| Asteraceae | *Flourensis*           | *campestris*           | Argentina               | NO           | aerial parts | 0.02         | 15.3 | 127  | [78]|
| Asteraceae | *Helichrysum*          | *indatum* Humbert      | Madagascar              | NO           | aerial parts | 0.19         | 33.1 | 141  | [79]|
| Asteraceae | *Helichrysum*          | *kraussii* Sch. Bip.   | South Africa            | NO           | aerial parts | n.a.         | 30.7 | 142  | [80]|
| Asteraceae | *Helichrysum*          | *melaleucum* Rich. ex Holl. | Spain                   | NO           | aerial parts | 0.10         | 35.4 | 145  | [39]|
| Asteraceae | *Koanophyllon*         | *villosum* (Sw.) King et Robins | Cuba              | NO           | aerial parts | 0.45         | 17.0 | 160  | [81]|
| Asteraceae | *Laggera*              | *oloptera* (DC.) C. D. Adams | Cameroon              | NO           | leaves      | 0.05         | 20.4 | 161  | [82]|
| Asteraceae | *Microglossa*          | *pyrrhopappa* var. *pyrrhopappa* (A. Rich) Agnew | Kenya                | NO           | leaves      | 0.40         | 20.3 | 185  | [83]|
| Asteraceae | *Mikania*              | *cordata* (Burm.f.) B.L. Robinson var. *cordata* | Ivory Coast    | NO           | leaves      | 0.63         | 11.8 | 187  | [84]|
| Asteraceae | *Oyesaea*              | *verbesinoides* DC.    | Venezuela               | NO           | leaves      | 0.05         | 27.1 | 211  | [85]|
| Asteraceae | *Perogyneum*           | *grandis* Hems. var. *nelsonii* (Robins. and Greeenm.) Fay | Costa Rica    | NO           | leaves      | 0.30         | 30.5 | 217  | [86]|
| Asteraceae | *Petasites*            | *japonicus* (Siebold and Zucc.) Maxim. | Japan         | NO           | leaves      | 0.02         | 21.9 | 218  | [87]|
| Asteraceae | *Pluchea*              | *carolinensis* (Jacq.) Sweet | Martinique            | NO           | leaves      | 0.11         | 21.1 | 236  | [88]|
| Family       | Genus                        | Species and Auth          | Geogr. Origin of Sample | Belfrit List | Part Used | E.O. Yield% | BCP% | Code | Ref. |
|-------------|-----------------------------|---------------------------|-------------------------|--------------|-----------|-------------|------|------|------|
| Asteraceae  | Porophyllum                 | obscurum (Spreng.) D.C.   | Argentina               | NO leaves    | 0.30      | 14.1        | 238  | [89] |
| Asteraceae  | Solidago                    | decurrens Loor            | China                   | NO leaves    | 0.37      | 15.4        | 266  | [90] |
| Asteraceae  | Tagetes                     | patula L.                 | Austria                 | NO flowers   | 0.15      | 53.5        | 273  | [91] |
| Asteraceae  | Tagetes                     | erecta L.                 | Iran                    | YES flowers  | 0.35      | 35.2        | 274  | [92] |
| Asteraceae  | Tanacetum                   | punctatum (Desr.) Grierson trilobus var. galpinii (Hutch. and E.Phillips) Paiva | South Africa | NO leaves    | 0.14      | 30.4        | 276  | [94] |
| Asteraceae  | Vernonia                    | chalybacea Mart.          | Brazil                  | NO aerial parts | 0.10    | 39.1        | 287  | [95] |
| Asteraceae  | Vernonia                    | scorioides (Lam.) Pers.   | Brazil                  | NO aerial parts | 0.10    | 30.6        | 288  | [96] |
| Asteraceae  | Xanthium                    | strumarium L.             | Pakistan                | NO leaves    | n.a.      | 17.5        | 291  | [97] |
| Asteraceae  | Tarchonanthus               |                            | Chile                   | NO aerial parts | 0.15    | 21.1        | 168  | [98] |
| Atherospermaeae | Daphnandra              | repandula (F.Muell.) F.Muell. | Australia | NO aerial parts | 0.20    | 12.2        | 105  | [99] |
| Boraginaceae | Cordia                     | leucocephala Moric        | Brazil                  | NO leaves    | 0.04      | 39.0        | 91   | [100] |
| Boraginaceae | Cordia                     | multispicata Cham.        | Brazil                  | NO leaves    | 0.25      | 56.6        | 92   | [101] |
| Burseraceae  | Bursera                     | aromatica (Proctor)       | Jamaica                 | NO leaves    | 0.03      | 21.7        | 59   | [102] |
| Burseraceae  | Bursera                     | microphylla A. Gray       | USA                     | NO oleo-gum-resin | 2.10    | 72.9        | 60   | [103] |
| Burseraceae  | Canarium                   | parvum Leen.              | Vietnam                 | NO leaves    | 0.20      | 18.7        | 63   | [104] |
| Burseraceae  | Dacryodes                  | edulis (G. Don) H. J. Lam | Nigeria                 | NO leaves    | 0.08      | 26.0        | 103  | [105] |
| Burseraceae  | Protium                    | heptaphyllum (Aubl.) March. | Brazil               | YES leaves   | 0.30      | 18.6        | 241  | [106] |
| Cannabaceae  | Cannabis                   | sativa L.                | Austria                 | YES aerial parts | n.a.    | 16.2        | 64   | [107] |
| Cannabaceae  | Cannabis                   | sativa L.                | Italy                   | YES flowers  | 0.10      | 23.8        | 65   | [108] |
| Cannabaceae  | Humulus                    | lupulus L.               | USA                     | YES aerial parts | n.a.    | 22.0        | 148  | [109] |
| Caryophyllaceae | Dianthus              | Caryophyllus L.           | Iran                    | YES aerial parts | n.a.    | 34.8        | 107  | [110] |
| Cephalotaxaceae | Cephalotaxus             | Harringtonia K.Koch subsp. harringtonia | India                  | NO twigs     | 0.01      | 21.1        | 77   | [111] |
| Clusiaceae  | Clusia                     | nemorosa G. Mey.          | Brazil                  | NO fruits    | 0.30      | 48.6        | 83   | [112] |
| Clusiaceae  | Caricinia                  | atrocooidis Griff. ex T. Anders. | Malaysia             | NO fruits    | n.a.      | 23.8        | 128  | [113] |
| Clusiaceae  | Kielmeiera                 | rugosa Choisy            | Brazil                  | NO fruits    | n.a.      | 16.4        | 158  | [114] |
| Clusiaceae  | Pentadesma                 | butyracea Sabine          | Benin                   | NO barks     | 0.08      | 74.0        | 214  | [115] |
| Clusiaceae  | Psorospermum               | corymbiferum Hochr        | Nigeria                 | NO leaves    | 0.02      | 46.8        | 245  | [116] |
| Convolvulaceae | Convolvulus           | persicus L.              | Iran                    | NO aerial parts | 0.04    | 47.0        | 86   | [117] |
| Family            | Genus          | Species and Auth         | Geogr. Origin of Sample | Belfrit List | Part Used | E.O. Yield% | BCP% | Code | Ref. |
|-------------------|----------------|--------------------------|-------------------------|--------------|-----------|-------------|------|------|------|
| Cupressaceae      | Cedrus         | atlantica G. Manetti     | Algeria                 | NO           | twigs     | 0.02        | 11.4 | 72   | [118]|
| Cupressaceae      | Juniperus      | macrocarpus Sibth. and Sm. (Jom) | Turkey          | NO           | fruits    | n.a.        | 29.6 | 156  | [119]|
| Cupressaceae      | Thuja          | orientalis L.            | Egypt                   | NO           | aerial parts | 2.60    | 24.0  | 281  | [120]|
| Cyperaceae        | Cyperus        | glomeratus L.            | Serbia                  | NO           | rhizomes and roots | 0.06    | 12.6  | 102  | [121]|
| Ehretiaceae       | Varronia       | curassavica Jacq.        | Brazil                  | NO           | leaves    | 0.6        | 41.2  | 285  | [122]|
| Ehretiaceae       | Varronia       | schomburgkii (DC.) Borhidi | French Guiana          | NO           | aerial parts | 0.06    | 47.0  | 286  | [123]|
| Euphorbiaceae     | Acalypha       | fraticosa Forssk         | India                   | NO           | leaves    | 1.40       | 42.0  | 2    | [124]|
| Euphorbiaceae     | Alchornea      | tilifolia (Benth.) Muell. | Vietnam                | NO           | aerial parts | n.a.    | 10.7  | 20   | [125]|
| Euphorbiaceae     | Euphorbia      | glandulosus L.           | Brazil                  | NO           | aerial parts | 0.12    | 53.2  | 95   | [127]|
| Euphorbiaceae     | Euphorbia      | pulegiodorus Baill.      | Brazil                  | NO           | aerial parts | 5.00    | 20.9  | 96   | [128]|
| Euphorbiaceae     | Phyllumhus     | Muellerianus (O. Kuntze) | Nigeria                | NO           | leaves    | 0.12       | 41.9  | 229  | [129]|
| Fabaceae          | Bauhinia       | rufa Steud.              | Brazil                  | NO           | leaves    | 0.01       | 15.8  | 50   | [130]|
| Fabaceae          | Boedichia      | virgilioides Kunt        | Brazil                  | YES          | seeds     | 2.20       | 44.1  | 57   | [131]|
| Fabaceae          | Caesalpinia    | decapetala (Roth) Alston | Japan                   | NO           | aerial parts | 0.07    | 17.2  | 61   | [132]|
| Fabaceae          | Copaifera      | langsdorffii Desf.      | YES                     | aeoloresins  | 28.00     | 72.0       | 88    | 133  | [133]|
| Fabaceae          | Copaifera      | multiuca Hayne          | Brazil                  | NO           | aeoloresins | n.a.    | 57.5  | 89   | [134]|
| Fabaceae          | Copaifera      | reticulata Duce          | Brazil                  | NO           | aeoloresins | n.a.    | 68.0  | 90   | [135]|
| Fabaceae          | Dalea          | carthagicensis L.       | Colombia                | NO           | leaves    | 0.15       | 20.7  | 104  | [136]|
| Fabaceae          | Eperrua        | duckeana Cowan          | Brazil                  | NO           | leaves    | 0.50       | 25.4  | 134  | [137]|
| Fabaceae          | Glycyrhiza     | trijilica Fisch. and C.A.Mey  | Iran                    | NO           | aerial parts | 0.50    | 25.4  | 134  | [138]|
| Fabaceae          | Psoralea       | bituminosa L.           | Italy                   | NO           | leaves    | 0.10       | 23.2  | 244  | [139]|
| Fabaceae          | Runchaasia     | minima DC.              | Kenya                   | NO           | aerial parts | 0.10    | 30.4  | 252  | [140]|
| Flacourtiaceae    | Caseria         | decandra Jacq.          | Brazil                  | NO           | leaves    | 0.20       | 13.0  | 67   | [141]|
| Flacourtiaceae    | Caseria         | sylvestris Swart.       | Brazil                  | NO           | leaves    | 0.60       | 27.5  | 68   | [142]|
| Geraniaceae       | Geranium       | wallichianum D. Don ex Sweet | India                | NO           | aerial parts | n.a.    | 15.9  | 130  | [143]|
| Gramineae         | Elyonurns      | muticus (Sprengel) O.Kuntze | Brazil                | NO           | leaves    | 0.45       | 17.9  | 109  | [144]|
Table 1. Cont.

| Family         | Genus              | Species and Auth                  | Geogr. Origin of Sample | Belfrit List | Part Used | E.O. Yield% | BCP% | Code | Ref. |
|----------------|--------------------|-----------------------------------|-------------------------|--------------|-----------|-------------|------|------|------|
| Gramineae      | Melinis            | minutiflor P. Beauv               | Kenya                   | NO           | aerial parts | 0.01 | 24.2 | 180  | [145]|
| Hernandiaceae  | Hernandia          | Nympheasia (C.Presl)             | Australia               | NO           | leaves      | 0.01 | 43.8 | 144  | [146]|
| Hypericaceae   | Hypericum          | brasiliense Choisy               | Brazil                  | NO           | aerial parts | 0.10 | 29.5 | 150  | [147]|
| Hypericaceae   | Hypericum          | perforatum L.                    | Iran                    | YES          | aerial parts | n.a. | 25.05| 151  | [148]|
| Hypericaceae   | Vismia             | baccifera subsp. dealbata (Kunth) Ewan | Venezuela               | NO           | leaves      | 0.07 | 45.7 | 289  | [149]|
| Juglandaceae   | Juglans            | regia L.                         | India                   | YES          | leaves      | 0.02 | 15.5 | 155  | [150]|
| Lamiaceae      | Aegiphila          | ihotzkiana Cham.                 | Brazil                  | NO           | leaves      | 0.02 | 27.5 | 9    | [151]|
| Lamiaceae      | Ajuga              | parviflora Benth.                | India                   | NO           | aerial parts | n.a. | 22.4 | 18   | [152]|
| Lamiaceae      | Ajuga              | comata Stapf.                    | Iran                    | NO           | aerial parts | n.a. | 30.9 | 19   | [153]|
| Lamiaceae      | Ballota            | nigra L.                         | Algeria                 | YES          | aerial parts | n.a. | 24.6 | 49   | [154]|
| Lamiaceae      | Clerodendrum       | polycephalum Baker              | Nigeria                 | NO           | leaves      | 0.16 | 28.9 | 82   | [155]|
| Lamiaceae      | Colquhounia        | cocinea Wall.                   | India                   | NO           | flower      | 0.20 | 53.2 | 84   | [156]|
| Lamiaceae      | Cunila             | incana Benth.                   | Brazil                  | NO           | aerial parts | 0.72 | 11.3 | 98   | [157]|
| Lamiaceae      | Cyclotrichium.     | strussi Bornm                   | Iran                    | NO           | aerial parts | 0.37 | 16.9 | 101  | [158]|
| Lamiaceae      | Glechoma           | hederaea L.                     | Lithuania               | NO           | aerial parts | 0.05 | 14.2 | 131  | [159]|
| Lamiaceae      | Glechon            | marfolia Benth.                 | Brazil                  | NO           | leaves      | 1.40 | 32.2 | 132  | [160]|
| Lamiaceae      | Hoslunda           | opposita Vahl.                  | Ivory Coast             | NO           | leaves      | 0.04 | 24.8 | 147  | [161]|
| Lamiaceae      | Hymenocrater      | calycinus (Boiss.) Benth.       | Iran                    | NO           | aerial parts | 0.20 | 32.8 | 149  | [162]|
| Lamiaceae      | Hyptidendron       | canum (Pohl ex Benth.)          | Brazil                  | NO           | leaves      | 0.82 | 41.6 | 152  | [163]|
| Lamiaceae      | Hyptis             | mutabilis (Rich.) Briq.         | Argentinia              | NO           | aerial parts | n.a. | 59.4 | 153  | [164]|
| Lamiaceae      | Hyptis             | suaveolens (L.) Poit.           | Bénin                   | YES          | fruits      | 0.10 | 43.7 | 154  | [165]|
| Lamiaceae      | Lallenmantia       | iberica (M. Bieb.) Fisch and CA Mey | Turkey                 | NO           | aerial parts | n.a. | 18.3 | 162  | [166]|
| Lamiaceae      | Leonotis           | ocymsophora (Burm.f.)           | South Africa            | NO           | leaves      | 0.06 | 30.8 | 166  | [167]|
| Lamiaceae      | Leonurus           | sibircus L.                     | Argentina               | NO           | aerial parts | n.a. | 35.2 | 167  | [164]|
| Lamiaceae      | Leucas             | aspera (Willd.) Link            | India                   | NO           | aerial parts | 0.30 | 34.2 | 169  | [168]|
| Lamiaceae      | Leucas             | indica (L.) R.Br                | India                   | NO           | aerial parts | n.a. | 51.1 | 170  | [169]|
| Lamiaceae      | Marrubium          | bourgacri subsp. caricum        | Tunisia                 | NO           | aerial parts | 0.07 | 23.2 | 175  | [170]|
| Lamiaceae      | Marxpiantes        | channuay (Vahl) Kuntze          | Brazil                  | NO           | aerial parts | n.a. | 15.1 | 176  | [171]|
| Family      | Genus                  | Species and Auth      | Geogr. Origin of Sample | Belfrit List | Part Used   | E.O. Yield% | BCP% | Code | Ref. |
|------------|------------------------|-----------------------|-------------------------|--------------|-------------|-------------|------|------|------|
| Lamiaceae  | Melissa                | *romana* Miller       | Italy                   | NO           | aerial parts | 0.30        | 15.8 | 181  | [172]|
| Lamiaceae  | Mentha                 | *longifolia* (L.) Hudson | Iran                    | NO           | aerial parts | 0.41        | 23.2 | 183  | [173]|
| Lamiaceae  | Micromeria             | *myrtifolia* Boiss. and Hohen. | Turkey                  | NO           | aerial parts | 0.20        | 40.8 | 186  | [174]|
| Lamiaceae  | Mosla                  | *soochovensis* Matsuda | China                   | NO           | aerial parts | 0.05        | 12.8 | 191  | [175]|
| Lamiaceae  | Nepeta                 | *fissa* C.A. Mey      | Iran                    | NO           | aerial parts | 0.25        | 33.1 | 200  | [176]|
| Lamiaceae  | Nepeta                 | *curciflora* Boiss.   | Lebanon                 | NO           | aerial parts | 0.30        | 50.2 | 201  | [177]|
| Lamiaceae  | Ocimum                 | *tenusiforum* L.      | India                   | YES          | aerial parts | 0.33        | 30.0 | 203  | [178]|
| Lamiaceae  | Originum               | *majorana* L.         | Algeria                 | YES          | aerial parts | 1.20        | 26.0 | 207  | [179]|
| Lamiaceae  | Orthodon               | *dianthiern* Maxim.   | Vietnam                 | NO           | aerial parts | 0.20        | 52.9 | 208  | [180]|
| Lamiaceae  | Orthosiphon            | *pallidus* Royle, ex Benth. | India                  | NO           | aerial parts | n.a.        | 17.4 | 209  | [181]|
| Lamiaceae  | Perilla                | *frutescens var. japonica* (Hassk.) H.Hara | China                  | YES          | leaves       | 0.11        | 37.2 | 215  | [182]|
| Lamiaceae  | Phlomis                | *rigida* Labill.       | Turkey                  | NO           | aerial parts | 0.05        | 38.7 | 221  | [183]|
| Lamiaceae  | Platostoma             | *menthoide* (L.) A. J. Paton | Sri Lanka              | NO           | aerial parts | 0.50        | 37.0 | 233  | [185]|
| Lamiaceae  | Plectranthus           | *rugosus* Wall.       | India                   | NO           | leaves       | n.a.        | 38.4 | 234  | [186]|
| Lamiaceae  | Pycnostachys           | *eminii* Gürke        | Ethiopia                | NO           | leaves       | 0.13        | 21.6 | 246  | [187]|
| Lamiaceae  | Rosmarinus             | *officinalis* L.      | Lebanon                 | YES          | aerial parts | 0.09        | 12.9 | 251  | [188]|
| Lamiaceae  | Salvia                 | *palaefolia* Kunth    | Colombia                | NO           | aerial parts | 0.06        | 32.2 | 253  | [189]|
| Lamiaceae  | Salvia                 | *bracteata* Banks and Soland | Iran                  | NO           | aerial parts | 0.28        | 41.4 | 254  | [190]|
| Lamiaceae  | Salvia                 | *hydrangea* DC. ex Benth. | Iran                  | NO           | aerial parts | 0.20        | 33.4 | 255  | [191]|
| Lamiaceae  | Salvia                 | *nemorosa* L.         | Iran                    | NO           | aerial parts | 0.12        | 41.6 | 256  | [192]|
| Lamiaceae  | Salvia                 | *virgata* Jacq.       | Iran                    | NO           | aerial parts | 0.48        | 46.6 | 257  | [193]|
| Lamiaceae  | Salvia                 | *canariensis* L.      | Spain                   | NO           | aerial parts | 4.00        | 30.2 | 258  | [194]|
| Lamiaceae  | Salvia                 | *montbretii* Benth.   | Turkey                  | NO           | aerial parts | 0.10        | 32.8 | 259  | [195]|
| Lamiaceae  | Scutellaria            | *havanensis* Jacq.   | Cuba                    | NO           | leaves       | 0.18        | 75.6 | 261  | [196]|
| Lamiaceae  | Scutellaria            | *brevebracteata* Stapf. subsp. *pannosula clandaestina* subsp. | Turkey | NO | aerial parts | n.a.        | 36.4 | 262  | [197]|
| Lamiaceae  | Sideritis              | *peloponnesiaca* (Boiss. and Heldr.) Baden | Greece | NO | aerial parts | 1.00        | 16.4 | 263  | [198]|
| Lamiaceae  | Sideritis              | *phlomoides* Boiss. and Bal. | Turkey | NO | aerial parts | 0.20        | 30.7 | 264  | [199]|
| Lamiaceae  | Stachys                | *viticinii* Boiss.    | Turkey                  | NO           | aerial parts | 0.20        | 62.3 | 269  | [200]|
| Family       | Genus                        | Species and Auth | Geogr. Origin of Sample | Belfrit List | Part Used | E.O. Yield% | BCP% | Code | Ref. |
|--------------|------------------------------|------------------|-------------------------|--------------|-----------|-------------|------|------|-----|
| Lamiaceae    | Teucrium arduini            | L.               | Croatia                 | NO           | aerial parts | 0.35        | 35.4 | 277  | [201] |
| Lamiaceae    | Teucrium flavum             | L.               | Iran                    | NO           | leaves      | 0.20        | 30.7 | 278  | [202] |
| Lamiaceae    | Teucrium siculum            | (Raf.) Guss.     | Italy                   | NO           | aerial parts | 0.10        | 30.9 | 279  | [203] |
| Lamiaceae    | Teucrium turredanum         | Losa and Rivas-Goday | Spain                | NO           | aerial parts | 0.60        | 32.0 | 280  | [204] |
| Lamiaceae    | Vitticrenna                 | queenslandica Munir | Australia              | NO           | leaves      | n.a.        | 33.6 | 290  | [205] |
| Lauraceae    | Aiouea costaricensis        | (Mez) Kosterm.   | Costa Rica              | NO           | leaf        | 0.10        | 12.0 | 17   | [207] |
| Lauraceae    | Alseodaphne peduncularis    | Meisn            | Malaysia                | NO           | leaves      | n.a.        | 24.0 | 27   | [208] |
| Lauraceae    | Aneba riparia               | (Nees) Mez       | Brazil                  | NO           | leaves      | 0.30        | 16.9 | 29   | [209] |
| Lauraceae    | Beilschmiedia penangiana    | Gamble           | Malaysia                | NO           | aerial parts | 0.10        | 12.6 | 51   | [210] |
| Lauraceae    | Cassytha pubescens R.Br.    |                 | Australia               | NO           | aerial parts | 0.10        | 30.9 | 69   | [211] |
| Lauraceae    | Cinnamomum tanala           | (Ham) Nees and Eberm. | Pakistan              | NO           | leaves      | 0.03        | 25.3 | 79   | [212] |
| Lauraceae    | Lithsea helferi Hook.f.     |                  | Vietnam                 | NO           | leaves      | 0.30        | 14.2 | 172  | [213] |
| Lauraceae    | Nectandra lanceolata        | Ness             | Brazil                  | NO           | leaves      | 0.20        | 32.5 | 198  | [214] |
| Lauraceae    | Neolitsea flosia            | (Nees) Gamble var. caesia (Meisner) Gamble | India          | NO           | leaves      | 0.10        | 35.3 | 199  | [215] |
| Lauraceae    | Ocotea duciei              | Vattimo-Gil      | Brazil                  | NO           | leaves      | 0.70        | 60.5 | 204  | [216] |
| Lauraceae    | Ocotea splendens            | (Meisn.) Baill   | Brazil                  | NO           | leaves      | 0.35        | 51.0 | 205  | [217] |
| Lauraceae    | Persea americana            | Mill.            | Nigeria                 | YES          | leaves      | 0.20        | 43.9 | 216  | [218] |
| Lauraceae    | Phoebe porphyria            | (Griseb.) Mez.   | Argentina               | NO           | aerial parts | 0.15        | 19.3 | 222  | [219] |
| Magnoliaceae | Magnolia obovata            | Thunb.           | Japan                   | NO           | leaves      | 0.05        | 23.7 | 173  | [220] |
| Malvaceae    | Pachira glabra              | Pasq.            | Nigeria                 | NO           | leaves      | 0.71        | 14.5 | 212  | [221] |
| Malvaceae    | Triunfetta rhomboides       | Jacq.            | Burkina-Faso            | NO           | aerial parts | 0.02        | 24.2 | 282  | [222] |
| Malvaceae    | Aglaia odorata              | Lour.            | Thailand                | NO           | stem        | 0.07        | 10.2 | 15   | [223] |
| Meliaceae    | Aphananxixis polystachya    | (Wall.) R.Parker | Bangladesh              | NO           | wood        | n.a.        | 19.4 | 35   | [224] |
| Meliaceae    | Cedrela fijisils            | Vellozo          | Brazil                  | NO           | leaves      | 0.06        | 26.3 | 70   | [225] |
| Meliaceae    | Guarea macrophyllo Vahl.    | ssp.              | Brazil                  | NO           | leaves      | 0.15        | 10.0 | 137  | [226] |
| Moraceae     | Ficus benjamina             | L.               | Nigeria                 | NO           | leaves      | n.a.        | 17.0 | 124  | [227] |
| Myricaceae   | Morella pensylvanica        | (Mirbel) Kartesz | Canada                  | NO           | aerial parts | 0.15        | 14.5 | 190  | [228] |
| Myristicaceae | Gymnacranthera              | canarica (King) Warb. | India          | NO           | leaves      | 0.01        | 23.4 | 138  | [229] |
| Family          | Genus             | Species and Auth | Geogr. Origin of Sample | Belfrit List | Part Used | E.O. Yield% | BCP%  | Code | Ref.  |
|-----------------|-------------------|------------------|-------------------------|--------------|-----------|-------------|-------|------|-------|
| Myristicaceae   | Knema             | kunstleri Warb.  | Malaysia                | NO           | aerial parts | 0.12        | 23.2  | 159  | [230]|
| Myristicaceae   | Myristica         | malabarica Lam.  | India                   | NO           | leaves      | 0.05        | 27.3  | 197  | [229]|
| Myrtaceae       | Blepharocalyx     | salicifolius O.Berg | Brazil                 | NO           | leaves      | 0.90        | 22.9  | 55   | [231]|
| Myrtaceae       | Eucalyptus        | leptophlebe F. Muell. | Australia              | NO           | leaves      | 0.01        | 11.4  | 118  | [232]|
| Myrtaceae       | Eugenia           | stipitata McVaugh ssp. sororia | Portugal | NO           | leaves      | 0.35        | 22.7  | 119  | [233]|
| Myrtaceae       | Feijoa            | sellowiana Berg.  | France                  | NO           | fruits      | 0.10        | 12.0  | 121  | [234]|
| Myrtaceae       | Marlierea         | silvatica Klaersk | Brazil                  | NO           | leaves      | 0.30        | 25.4  | 174  | [235]|
| Myrtaceae       | Melaleuca         | (Viro) Craven and J.W. Dawson | New Caledonia | NO           | leaves      | 0.10        | 28.8  | 178  | [236]|
| Myrtaceae       | Myrcia            | cuprea (O. Berg) Klaersk. | Brazil                 | NO           | aerial parts | 0.10        | 39.1  | 194  | [237]|
| Myrtaceae       | Myrcianthes       | pseudo-nato (Legr.) Mc. Vaugh | Argentina          | NO           | leaves      | 0.30        | 18.9  | 195  | [238]|
| Myrtaceae       | Myrciaria         | tenella (DC.) Berg | Brazil                 | NO           | leaves      | 0.40        | 25.1  | 196  | [239]|
| Myrtaceae       | Ochrosperma       | lineare (C.T. White) Trudgen | Australia              | NO           | aerial parts | 0.30        | 11.6  | 202  | [240]|
| Myrtaceae       | Plinia            | edulis (Vell.) Sobral | Brazil                  | NO           | leaves      | 0.10        | 21.2  | 235  | [241]|
| Myrtaceae       | Psidium           | striatum DC.      | Brazil                  | NO           | leaves      | 0.10        | 28.6  | 243  | [242]|
| Myrtaceae       | Syzygium         | aromaticum L.     | Morocco                 | YES         | buds        | 8.58        | 27.5  | 270  | [243]|
| Myrtaceae       | Syzygium         | grande (Wight) Walp. | Vietnam          | NO           | stem        | 0.12        | 29.3  | 271  | [244]|
| Myrtaceae       | Uromyrtus         | australis A. J. Scott | Australia            | NO           | leaves      | 0.12        | 20.7  | 283  | [245]|
| Papilionaceae   | Meristemopsis     | zanthisoides Vassil. | Iran                | NO           | aerial parts | 3.20        | 11.8  | 184  | [246]|
| Phyllanthaceae  | Actephila        | excelsa (Dazl.) Muell. | Vietnam          | NO           | leaves      | 0.15        | 11.2  | 7    | [247]|
| Pinaceae        | Abies             | nephradepis (Khingan fir) | South Korea          | NO           | needles      | 0.40        | 10.8  | 1    | [248]|
| Pinaceae        | Pinus             | pinaster Aiton    | Morocco                 | YES         | needles      | 0.38        | 22.2  | 225  | [249]|
| Pinaceae        | Pinus             | armandii Franch.  | Scotland                | NO           | needles      | n.a.        | 36.3  | 226  | [250]|
| Pinaceae        | Pinus             | bungeana Zucc.    | South Korea             | NO           | needles      | 0.31        | 27.2  | 227  | [251]|
| Pinaceae        | Pinus             | halepensis Mill.  | Turkey                  | NO           | needles      | n.a.        | 25.9  | 228  | [252]|
| Piperaceae      | Piper             | tuberculatum var. tuberculatum (Miq.) CDC | Brazil             | NO           | leaves      | n.a.        | 26.3  | 229  | [253]|
| Piperaceae      | Piper             | guineense Schumach. and Thonn. | Cameroon          | NO           | seeds       | 1.1        | 57.6  | 230  | [254]|
| Piperaceae      | Piper             | nigrum L.         | India                   | YES         | seeds       | n.a.        | 45.3  | 231  | [255]|
| Family          | Genus       | Species and Auth | Geogr. Origin of Sample | Befrit List | Part Used | E.O. Yield% | BCP%  | Code | Ref. |
|-----------------|-------------|------------------|-------------------------|-------------|-----------|-------------|-------|------|------|
| Piperaceae      | *Piper*     | *maingayi* HK. F. | Malaysia                | NO          | seeds     | 0.21        | 39.6  | 232  | [256]|
| Piperaceae      | *Pothomorpha* | *pellata* (L.) Miq. | Brazil                  | NO          | leaves    | 0.20        | 68.0  | 239  | [257]|
| Plantaginaceae  | *Adenosma*  | *indianum* (Lour.) Merr. | China                   | NO          | aerial parts | 0.29       | 10.32 | 8    | [258]|
| Podocarpaceae   | *Afrocarpus* | *mannii* (Hook.f.) C.N.Page | S. Tomé e Principe     | NO          | leaves    | 0.15        | 13.1  | 12   | [259]|
| Pteroxylycaeae  | *Cadrelopsis* | *greevi* H. Baillon | Madagascar             | NO          | barks     | n.a.        | 10.6  | 71   | [260]|
| Rosaceae        | *Agrimonia* | *caputoria* L. | Iran                    | YES         | flowers   | 1.20        | 42.8  | 16   | [261]|
| Rosaceae        | *Rosa*      | *canina* L.      | Tunisia                 | YES         | flowers   | 1.40        | 32.0  | 250  | [262]|
| Rubiaceae       | *Cruciata*  | *laccipes* Opiz  | Italy                   | YES         | aerial parts | 0.70       | 19.0  | 97   | [263]|
| Rubiaceae       | *Geophila*  | *repens* (L.) I.M. Johnst | China                  | NO          | aerial parts | 0.07       | 23.3  | 129  | [264]|
| Rutaceae        | *Aegle*     | *marmelos* (L.) Corr. | Nepal                   | YES         | leaves    | 0.29        | 29.6  | 10   | [265]|
| Rutaceae        | *Amyris*    | *elimifera* L.   | Cuba                    | NO          | leaves    | 0.60        | 37.8  | 28   | [266]|
| Rutaceae        | *Atalantia* | *buxifolia* (Poix.) Oliv. | China                  | NO          | leaves    | 0.36        | 25.8  | 47   | [267]|
| Rutaceae        | *Boennninghausenia* | *albiflora* Reichb. | India                   | NO          | flowers   | 0.20        | 13.1  | 56   | [268]|
| Rutaceae        | *Citrus*    | *garratasi* F.M.Bailey | Australia              | NO          | leaves    | 0.20        | 17.6  | 80   | [269]|
| Rutaceae        | *Feroniella* | *lucida* (Scheff.) Swing | Thailand              | NO          | leaves    | 0.12        | 26.6  | 122  | [270]|
| Rutaceae        | *Flindersia* | *pimenteliana* F.Muell. | Australia              | NO          | leaves    | 0.03        | 16.9  | 126  | [271]|
| Rutaceae        | *Haplophyllum* | *villosum* (M. B.) G. Don | Iran                   | NO          | aerial parts | 0.22       | 13.1  | 139  | [272]|
| Rutaceae        | *Medicosna* | *ebocata* T.G. Hartley | Australia              | NO          | aerial parts | 0.40       | 17.2  | 177  | [273]|
| Rutaceae        | *Melocote*  | *peninsularis* T.G. Hartley | Australia             | NO          | leaves    | 0.10        | 49.0  | 179  | [274]|
| Rutaceae        | *Murraya*   | *paniculata* L.  | Brazil                  | NO          | leaves    | 0.03        | 57.6  | 192  | [275]|
| Rutaceae        | *Murraya*   | *koenigii* (L.) Spreng | India                 | YES         | leaves    | 0.1        | 45.9  | 193  | [276]|
| Rutaceae        | *Pamburus*  | *missionis* (Wight) Swingle | India                 | NO          | leaves    | 0.05        | 25.4  | 213  | [277]|
| Rutaceae        | *Spiranthera* | *odoratisissina* A. St. Hil. | Brazil             | NO          | leaves    | 0.10        | 23.8  | 267  | [278]|
| Rutaceae        | *Zanthoxylum* | *veneficum* F.M.Bailey | Australia              | NO          | leaves    | 0.10        | 36.3  | 292  | [279]|
| Sapindaceae     | *Acer*      | *truncatum* Bunge | China                   | NO          | leaves    | n.a.        | 12.9  | 3    | [280]|
| Schisandraceae  | *Kadsura*   | *coccinea* (Lem.) A.C. Smith | China                 | NO          | roots     | 0.20        | 24.9  | 157  | [281]|
| Scrophulariaeae | *Buddleia*  | *asiatica* Lour.  | India                   | NO          | leaves    | 0.30        | 15.8  | 58   | [282]|
| Scrophulariaeae | *Capraria*  | *biflora* L.     | Brazil                  | NO          | leaves    | 0.09        | 29.6  | 66   | [283]|
| Solanaceae      | *Solanum*   | *stipulaceum* Roem and Schult | Brazil             | NO          | flowers    | 0.08        | 25.8  | 265  | [284]|
| Verbenaceae     | *Aloysia*   | *virgata* Juss.   | Cuba                    | NO          | aerial parts | n.a.       | 15.4  | 22   | [285]|
| Verbenaceae     | *Lantana*   | *montevicensis Briq | Brazil                 | NO          | leaves    | 0.13        | 31.5  | 163  | [286]|
| Verbenaceae     | *Lantana*   | *camara* L.      | Madagascar             | NO          | aerial parts | 0.08       | 43.61 | 164  | [287]|
| Family       | Genus      | Species and Auth | Geogr. Origin of Sample | Belfrit List | Part Used | E.O. Yield% | BCP% | Code | Ref. |
|--------------|------------|------------------|-------------------------|--------------|-----------|-------------|------|------|------|
| Verbenaceae  | Lippia     | *myrsinacea* Schltdl. et Cham. | Costa Rica       | NO leaves   | 0.08      | 16.1        | 171  | [288]|
| Verbenaceae  | Petitia    | *domingensis* Jacq. | Cuba                     | NO flowers   | n.a.      | 35.7        | 219  | [289]|
| Zingiberaceae| Aframomum  |                | Ethiopia                  | NO leaves   | 0.50      | 60.7        | 11   | [290]|
| Zingiberaceae| Alpinia    | *purpurata* (Viell.) | Fiji                     | NO flowers   | 0.05      | 24.2        | 23   | [291]|
| Zingiberaceae| Alpinia    | *conchigera* Griff. | Malaysia                  | NO rhizomes  | 0.14      | 10.0        | 24   | [292]|
| Zingiberaceae| Alpinia    | *mutica* Roxb.     | Vietnam                   | NO fruit     | 0.17      | 22.6        | 25   | [293]|
| Zingiberaceae| Alpinia    | *pinnanensis* T. L. Wu and Senjen | Vietnam     | NO fruit     | 0.23      | 11.4        | 26   | [294]|
| Zingiberaceae| Costus     | *afer* Ker–Grawl  | Nigeria                   | NO leaves | n.a.      | 12.3        | 93   | [295]|
| Zingiberaceae| Curcuma    | *longa* L.        | India                      | YES rhizomes | 2.20      | 9.8         | 99   | [296]|
| Zingiberaceae| Etlingera  | *elatior* (Jack) R. M. Smith | Malaysia      | NO leaves    | 0.70      | 10.7        | 117  | [297]|
| Zingiberaceae| Globba     | *schomburgii* Hook. f. | India                    | NO aerial parts | 0.01    | 31.7        | 133  | [298]|
| Zingiberaceae| Hedychium  | *coronarium* Koen. | Brazil                   | YES leaves   | 0.68      | 43.0        | 140  | [299]|
| Zingiberaceae| Renealmia  | *breviscapa* Poepp. and Endl. | Brazil       | NO rhizomes  | 0.01      | 62.3        | 247  | [300]|
| Zingiberaceae| Renealmia  | *alpinia* (Rottb.) Maas | Brazil         | NO leaves    | 0.50      | 22.9        | 248  | [301]|
| Zingiberaceae| Zingiber   | *nimmonii* Dalzell | India                  | NO rhizomes  | 0.04      | 42.2        | 293  | [302]|
The essential oil yield of 243 species ranged from 0.001 to 8.58%, whereas the BCP percentage of all selected species ranged from 9.8 (the threshold minimum level for species selection) to 75.6% (Table 2), providing an average percentage of 0.42% for yield and 27.4% for BCP. As shown in Table 2, variability was higher for yield percentages than for BCP percentage. The reason for the yield and BCP variability depends on several factors, including plant part, the quantity of plant material distilled and, most of all, the genetic variability and phenotypic plasticity of plants [303–306].

Table 2. General statistics on BCP and yield percentages of plant species listed in Table 1.

| Specification | Essential Oil Yield | Percentage of BCP |
|---------------|---------------------|-------------------|
| Number of cases | 243 | 295 |
| Range | | |
| Minimum | 0.00 | 9.8 |
| Maximum | 8.58 | 75.6 |
| Mean | 0.42 | 27.4 |
| S.E.M. | 0.06 | 0.8 |
| S.D. | 0.87 | 13.6 |
| C.V . % | 2.09 | 0.5 |

S.E.M., standard error of the mean; S.D., standard deviation; C.V ., coefficient of variation.

In order to look for plant species with the highest BCP and yield percentages, a scatter plot was obtained, as depicted in Figure 1. The highest yield and BCP percentages were found for Copaifera langsdorffii. High BCP percentages but with decreasing yields were found for Bursera microphylla, Scutellaria havanensis and Pentadesma butyracea. Copaifera species, popularly known as copaiba oil, are widely used in Brazilian popular medicine and the genus is known for its high essential oil yield and BCP content [135,307,308]. The genus Bursera belongs to the plant family Burseraceae and contains several aromatic spices producing oleo-gum resins, such as the traditional incenses, frankincense and myrrh [309]. Pentadesma butyracea (Clusiaceae) is a dense forest species which is found in the center and north of Benin forests whose bark, rough and deeply cracked, exudes a thick resinous juice, of reddish yellow color [115]. The Scutellaria genus (Lamiaceae) consists of plants which are widely distributed throughout the world; S. butyracea is an endemic plant native from Havana and is ethnomedically used for several purposes because of its BCP content [196].

High yields with lower BCP percentages were found for Acalypha fruticosa, Achyrocline alata, Agrimonia eupatoria, Boudichia virgilioides, Bursera microphylla, Croton pulegiodorus, Curcuma longa, Glechon marifolia, Laser trilobum, Meriosttropis xanthoides, Origanum majorana, Pimpinella kotschyana, Piper guineense, Rosa canina, Salvia canariensis, Spondias pinnata, Syzygium aromaticum and Thuja orientalis. All other species had a yield ranging from 0.004 to 1% and a BCP content ranging from 9.8 to 55% (Figure 1).

The plant part that contained the highest content of BCP was then analyzed. In order to evidence the statistical linkage between the plant parts, a cluster analysis was calculated by considering as category the plant part and as variables the number of species, the BCP% and the yield% reported in Table 1 (Figure 2). Euclidean distances were calculated by using the average linkage method. Five clusters were evidenced: the first cluster was made by plant parts reported in more than 100 species and was dominated by leaves and aerial parts, which contained in general a BCP percentage lower than 28%. The other four clusters were made by plant parts reported in less than 16 species. These four clusters were further subdivided according to their BCP content (Figure 2). As expected, the highest BCP percentage was found in oleo-gum resins (cluster 2), followed by roots, barks and branches (cluster 3). Flowers and buds (cluster 4) showed a high yield, whereas twigs and woods (cluster 5) had both low yields and BCP percentages (Figure 2).
Figure 1. Scatter plot of BCP percentage vs. yield percentage. The yield axis is represented as a power of 0.3 scale in order to evidence species with yields ranging from 0.004 to 3%. Numbers correspond to plant species listed in Table 1. Filled circles outline the species outside the central group of all other species (hollow circles).

Figure 2. Cluster analysis of BCP and yield percentages according to the plant part used for extraction. Euclidean distances are calculated with average linkage method. Five clusters are evident (see text for explanation).

Table 3 summarizes the statistical analysis of BCP and yield percentages reported from different plant parts.
Table 3. Average percentages of BCP and yields from plant parts as reported in plant species listed in Table 1. (±S.E.M.); n.c., not computable; E.O., essential oil.

| Plant Part   | Number of Species | BCP %        | E.O. Yield % |
|--------------|-------------------|--------------|--------------|
| Aerial Parts | 115               | 25.19 (±1.10) | 0.42 (±4.85) |
| Barks        | 3                 | 39.03 (±18.59)| 0.30 (±0.22) |
| Branches     | 1                 | 34.90 (±n.c.) | 0.20 (± n.c.)|
| Buds         | 1                 | 27.50 (± n.c.)| 8.58 (± n.c.)|
| Flowers      | 16                | 29.29 (±3.11) | 0.41 (±0.13) |
| Fruits       | 9                 | 26.93 (±4.43) | 0.24 (±0.07) |
| Leaves       | 128               | 27.58 (±1.15) | 0.30 (±0.04) |
| Oleo-gum resin | 4               | 66.13 (±4.54) | 15.50 (±8.30) |
| Rhizomes     | 5                 | 27.38 (±10.65)| 0.49 (±0.43) |
| Roots        | 7                 | 39.77 (±5.37) | 1.77 (±0.92) |
| Stems        | 3                 | 25.07 (±7.66) | 0.13 (±0.04) |
| Twigs        | 2                 | 16.25 (±4.85) | 0.02 (±0.01) |
| Wood         | 1                 | 19.40 (± n.c.)| 0.42 (±n.c.) |

The next analysis was at the familial level. A cluster analysis was calculated with average linkage method by using data of Table 1 by considering as a category the plant families and the species number, yield% and BCP% as variables. The results of the cluster analysis show the presence of 6 clusters (Figure 3). The first cluster is made by the Asteraceae and the Lamiaceae which consist of a number of species > 50 and a BCP% < 31. The second cluster gathers all families whose species have a BCP% > 35%; in this cluster, the Magnoliaceae and the Papilionaceae are separated in a subcluster because of their high BCP% and low yield%, whereas the Fabaceae (which include the above mentioned C. langsdorffii) are separated in a subcluster because of their high yield %. The third cluster is made by families with a number of species > 13 and a BCP% > 23%; here, the Lauraceae, the Apiaceae and the Zingiberaceae are separated in a subcluster because of their higher BCP%. The genus Ocotea is one of the largest of the Lauraceae family, with approximately 350 species distributed throughout tropical and subtropical America. O. splendens, as many other Ocotea species [212] is characterized by a high percentage of BCP [217]. In the Apiaceae family, the species P. kotschyanum spreads widely through Anatoly, Iran (northwest, west and center) and north of Iraq and contains BCP in all plant parts [41]. The family Zingiberaceae is well known for producing essential oils that are used to prevent and control several diseases; the species R. breviscapa was found to possess a high percentage of BCP [300]. The fourth cluster is made by families with a BCP% > 26 and a subcluster separates the Atherospermaceae, the Flacourtiaceae and the Meliaceae because of their BCP%. The fifth cluster is made by families with a BCP% < 25 and the Plantaginaceae are separated in a subcluster because of their relatively higher yield%. Finally, the sixth cluster is made by plant families with a low BCP percentage and a subcluster separates the Hernandiaceae, the Juglandaceae, the Phyllanthace and the Ptaeroxylaceae because of their BCP content lower than 11%.
Figure 3. Cluster analysis of BCP and yield percentages according to the plant families. Euclidean distances are calculated with average linkage method. Six clusters are evident (see text for explanation).

Table 4 describes the statistical data related to plant families.

The next analysis aimed to evidence the geographical areas from which the plant species listed in Table 1 were collected. A cluster analysis was calculated with average linkage method, considering the country of origin as a category of their species number, yield% and BCP% as variables. The results of the cluster analysis show the presence of 6 clusters (Figure 4). The first cluster gathers countries with the highest number of species and a BCP percentage higher than 28%; here, a subcluster separates Brazil from India and Iran because of the higher number of species, in agreement with the literature data [310]. The second and third clusters identify countries where BCP has the highest percentages, whereas the fourth cluster gathers countries with a number of species higher than 8. The fifth cluster is made by countries where the BCP content is the lowest, whereas the sixth cluster is made by two subclusters with BCP percentages ranging from 18 to 25%. One of these subclusters is made by countries (Colombia, Fiji, Kenya, Morocco, Niger, North Korea, Portugal and Togo) where the species had a BCP percentage higher than 24% (Figure 4).
Table 4. Average percentages of BCP and yields from plant families belonging to the plant species reported in Table 1. (±S.E.M.); n.c., not computable; n.a., not available; E.O., essential oil.

| Family             | Number of Species | BCP%   | E.O. Yield% |
|--------------------|-------------------|--------|-------------|
| Anacardiaceae      | 2                 | 13.25  | n.a.        |
| Annonaceae         | 15                | 22.17  | 0.20 (±0.05)|
| Apiaceae           | 16                | 30.96  | 0.37 (±0.14)|
| Apocynaceae        | 3                 | 17.63  | 0.26 (±0.10)|
| Araliaceae         | 1                 | 39.00  | 0.04 (n.c.) |
| Aristolochiaceae   | 2                 | 26.65  | 0.21 (±0.13)|
| Asteraceae         | 50                | 27.94  | 0.47 (±0.14)|
| Atherospermaceae   | 1                 | 32.20  | 0.06 (n.c.) |
| Boraginaceae       | 2                 | 22.95  | 0.15 (±0.10)|
| Burseraceae        | 5                 | 24.20  | 0.14 (±0.02)|
| Cannabaceae        | 3                 | 20.24  | 0.27 (±0.14)|
| Caryophyllaceae    | 1                 | 46.60  | 0.48 (n.c.) |
| Cephalotaxaceae    | 1                 | 41.60  | 0.82 (n.c.) |
| Clusiaceae         | 5                 | 25.85  | 0.29 (±0.19)|
| Convolvulaceae     | 1                 | 15.10  | n.a.        |
| Cupressaceae       | 3                 | 23.83  | 1.59 (±0.84)|
| Cyperaceae         | 1                 | 38.40  | n.a.        |
| Ehretiaceae        | 2                 | 41.95  | 1.10 (n.c.) |
| Euphorbiaceae      | 6                 | 25.60  | 0.42 (±0.46)|
| Fabaceae           | 11                | 36.92  | 3.89 (±3.45)|
| Flacourtiaiaceae   | 2                 | 27.75  | n.a.        |
| Geraniaceae        | 1                 | 13.10  | 0.22 (n.c.) |
| Gramineae          | 2                 | 27.90  | 0.19 (±0.09)|
| Hernandiaceae      | 1                 | 9.80   | 2.20 (n.c.) |
| Hypericaceae       | 3                 | 41.10  | 0.13 (±0.05)|
| Juglandaceae       | 1                 | 10.00  | 0.15 (n.c.) |
| Lamiaceae          | 57                | 31.03  | 0.41 (±0.17)|
| Lauraceae          | 13                | 29.33  | 0.38 (±0.18)|
| Magnoliaceae       | 1                 | 56.90  | 0.30 (n.c.) |
| Malvaceae          | 2                 | 19.70  | 0.11 (±0.04)|
| Meliaceae          | 4                 | 30.55  | 0.14 (±0.03)|
| Moraceae           | 1                 | 37.80  | 0.60 (n.c.) |
| Myricaceae         | 1                 | 18.10  | 0.30 (n.c.) |
| Myristicaceae      | 3                 | 42.93  | 1.35 (±0.85)|
| Myrtaceae          | 15                | 23.49  | 0.27 (±0.08)|
| Papilionaceae      | 1                 | 52.00  | 0.30 (n.c.) |
| Phyllanthace       | 1                 | 10.70  | n.a.        |
| Pinaceae           | 5                 | 23.22  | 0.20 (±0.06)|
| Piperaceae         | 5                 | 19.70  | 0.23 (±0.07)|
| Plantaginaceae     | 1                 | 20.90  | 5.00 (n.c.) |
| Podocarpaceae      | 1                 | 12.90  | n.a.        |
| Pterocarpaceae     | 1                 | 11.30  | 0.72 (n.c.) |
| Rosaceae           | 2                 | 18.00  | 0.10 (±0.08)|
| Rubiaceae          | 2                 | 17.15  | 0.03 (n.c.) |
| Rutaceae           | 15                | 22.97  | 0.27 (±0.06)|
| Sapindaceae        | 1                 | 36.30  | n.a.        |
| Schisandraceae     | 1                 | 32.00  | 1.40 (n.c.) |
| Scrophulariaceae   | 2                 | 21.75  | 0.10 (n.c.) |
| Solanaceae         | 1                 | 12.20  | 0.20 (n.c.) |
| Verbenaceae        | 5                 | 24.70  | 1.59 (±1.20)|
| Zingiberaceae      | 13                | 28.61  | 0.22 (±0.06)|
Figure 4. Cluster analysis of BCP and yield percentages according to the country of origin of extracts. Euclidean distances are calculated with average linkage method. Six clusters are evident (see text for explanation).

Table 5 summarizes the statistics related to countries of origin.
Table 5. Average percentages of BCP and yields from countries from which plant species reported in Table 1 were sampled. (±S.E.M.); n.c., not computable; n.a., not available; E.O., essential oil.

| Country              | Number of Species | BCP%   | E.O. Yield% |
|----------------------|-------------------|--------|-------------|
| Algeria              | 3                 | 20.67 (±4.65) | 0.61 (±0.59) |
| Argentina            | 8                 | 25.85 (±5.41) | 0.19 (±0.07) |
| Australia            | 18                | 25.70 (±2.98) | 0.18 (±0.04) |
| Austria              | 2                 | 34.85 (±18.65) | 0.15 (n.c.) |
| Bangladesh           | 1                 | 19.40 (n.c.) | n.a.        |
| Benin                | 3                 | 43.77 (±17.44) | 0.09 (±0.01) |
| Brazil               | 56                | 33.01 (±2.20) | 1.08 (±0.59) |
| Burkina Faso         | 2                 | 21.65 (±2.55) | 0.38 (±0.36) |
| Cameroon             | 4                 | 34.40 (±8.12) | 0.56 (±0.30) |
| Canada               | 1                 | 14.50 (n.c.) | 0.15 (n.c.) |
| Chile                | 1                 | 21.10 (n.c.) | 0.15 (n.c.) |
| China                | 11                | 19.26 (±2.54) | 0.18 (±0.04) |
| Colombia             | 2                 | 26.45 (±5.75) | 0.11 (±0.05) |
| Costa Rica           | 3                 | 19.53 (±5.61) | 0.16 (±0.07) |
| Croatia              | 1                 | 35.40 (n.c.) | 0.35 (n.c.) |
| Cuba                 | 5                 | 36.30 (±10.85) | 0.41 (±0.12) |
| Egypt                | 2                 | 36.95 (±12.95) | 2.30 (±0.30) |
| Ethiopia             | 2                 | 41.15 (±19.55) | 0.32 (±0.19) |
| Fiji                 | 1                 | 24.20 (n.c.) | 0.05 (n.c.) |
| France               | 2                 | 12.35 (±0.35) | 0.15 (±0.05) |
| French Guiana        | 1                 | 47.00 (n.c.) | 0.06 (n.c.) |
| Greece               | 1                 | 16.40 (n.c.) | 1.00 (n.c.) |
| India                | 29                | 27.00 (±2.32) | 0.34 (±0.11) |
| Iran                 | 30                | 28.69 (±2.02) | 0.67 (±0.22) |
| Italy                | 5                 | 22.54 (±2.55) | 0.26 (±0.12) |
| Ivory Coast          | 5                 | 22.24 (±3.48) | 0.25 (±0.13) |
| Jamaica              | 1                 | 21.70 (n.c.) | 0.03 (n.c.) |
| Japan                | 3                 | 20.93 (±1.94) | 0.05 (±0.02) |
| Kenya                | 3                 | 24.97 (±2.94) | 0.17 (±0.12) |
| Lebanon              | 2                 | 31.55 (±18.65) | 0.20 (±0.11) |
| Lithuania            | 1                 | 14.20 (n.c.) | 0.05 (n.c.) |
| Madagascar           | 3                 | 29.10 (±9.74) | 0.14 (±0.06) |
| Malaysia             | 7                 | 20.56 (±3.98) | 0.25 (±0.11) |
| Martinique           | 1                 | 21.10 (n.c.) | 0.11 (n.c.) |
| Morocco              | 2                 | 24.85 (±2.65) | 4.48 (±4.10) |
| Nepal                | 1                 | 29.60 (n.c.) | 0.29 (n.c.) |
| New Caledonia        | 1                 | 28.80 (n.c.) | 0.10 (n.c.) |
| Niger                | 1                 | 24.00 (n.c.) | 0.30 (n.c.) |
| Nigeria              | 10                | 25.87 (±4.39) | 0.19 (±0.09) |
| North Korea          | 1                 | 24.00 (n.c.) | 0.40 (n.c.) |
| Pakistan             | 2                 | 21.40 (±3.90) | 0.03 (n.c.) |
| Portugal             | 2                 | 23.65 (±0.95) | 0.26 (±0.09) |
| S. Tome e Prince     | 1                 | 13.10 (n.c.) | 0.15 (n.c.) |
| Scotland             | 1                 | 36.30 (n.c.) | n.a.        |
| Serbia               | 4                 | 18.35 (±3.47) | 0.05 (±0.03) |
| South Africa         | 5                 | 24.86 (±3.65) | 0.09 (±0.02) |
| South Korea          | 4                 | 16.30 (±3.83) | 0.36 (±0.05) |
| Spain                | 4                 | 28.23 (±4.44) | 1.23 (±0.93) |
| Sri Lankia           | 1                 | 37.00 (n.c.) | 0.50 (n.c.) |
| Thailand             | 2                 | 18.40 (±8.20) | 0.10 (±0.03) |
| Togo                 | 1                 | 25.20 (n.c.) | 0.50 (n.c.) |
| Tunisia              | 3                 | 32.00 (±5.08) | 0.52 (±0.44) |
| Turkey               | 14                | 29.21 (±3.51) | 0.25 (±0.08) |
| USA                  | 2                 | 47.45 (±25.45) | 2.10 (n.c.) |
| Venezuela            | 2                 | 36.40 (±9.30) | 0.06 (±0.01) |
| Vietnam              | 11                | 22.38 (±4.01) | 0.28 (±0.08) |
In order to separate which species containing BCP were also present in the Belfrit list, a scatter plot was obtained by selecting BCP% and yield% as variables (Figure 5). *C. langsdorffii*, *S. aromaticum*, *C. longa* and *B. virgilioides* were characterized by a yield ranging from 2 to 28%, with varying percentages of BCP; on the other hand, high percentages of BCP but lower yields% were found for *A. eupatoria*, *H. coronarium*, *C. odorata*, *P. americana* and *M. keonigi*. All other species showed both lower yields and BCP percentage.

![Figure 5. Scatter plot of BCP% and yield% of plant species present in the Belfrit list. The yield axis is scaled as a power of 0.2 in order to evidence species with yields ranging from 0.02 to 8.6%.](image)

**3. Materials and Methods**

3.1. **Systematic Analysis of BCP-Containing Plant Species**

After a preliminary search by using different databases, the work was performed by using Clarivate Analytics Web of Science as a database (http://apps.webofknowledge.com). The basic search criterion was on the general search for the molecule (caryophyllene), then the exclusion criteria were the presence of BCP and a percentage of BCP in the reported results higher than 10%. Papers reporting the occurrence of BCP where then downloaded and saved as a pdf for further reading and collection of information.

3.2. **Statistical Analysis**

The binomial name of the species (including the author), the family of belonging, the plant part used, the country of origin of the sample, the yield and the BCP percentages were inserted in a database by using Systat® 10 software (Systat Software Inc., San Jose, California, U.S.A.). Data were organized in columns and used for further processing. Average values along with ranges, standard deviation (S.D.), standard error of the mean (S.E.M.) and coefficient of variation (C.V.) were calculated by considering as grouping categories either the species, families, country of origin or plant part used.
As a classification statistical method, a cluster analysis was calculated by considering for each category the total number of species, the BCP percentage and the yield percentage by using Systat® 10 software. Euclidean distances were calculated with the average linkage method. Data were plotted as either scatter plots of yield percentage vs. BCP percentage or dendrograms showing the different clusters according to the calculated distance.

4. Conclusions

The attractiveness of BCP, a natural sesquiterpene present in the essential oil of different plant species, arises from its pharmacological feature as a CB2 receptor agonist. This characteristic, along with the lack of interaction with the CB1, makes BCP an interesting plant endocannabinoid with the advantage of lacking any psychotropic effect, as is typical of some Cannabis extracts [8,311,312].

This systematic analysis of published literature on plant species containing BCP in their essential oils identified the species with the highest yield and BCP content and allowed to select which species are also present in the Belfrit list (i.e., potentially attractive for pharmaceutical and nutraceutical industries).

This survey also evidenced the common practice of many authors to ignore the importance of providing the yield of the distilled essential oil, which represent a basic starting point for all industrial applications of the plant species under study. This problem was often correlated with the low amount of plant material distilled. Although interesting from a chemical-analytical point of view, the sole chemical analysis of the essential oil is not useful if performed on a single plant or a few plants, because it does not provide any information on the population genetic variability, being mainly affected by phenotypic plasticity, which is responsible for individual variations inside a population [305].

This work identified some top species like *C. langsdorffii*, *C. odorata*, *H. lupulus*, *P. nigrum* and *S. aromaticum*, which provide a high percentage of BCP along with interesting yields. These species, upon a skillful molecular fractionation to remove undesired/toxic monoterpenes, may provide high percentages of BCP that can be used for the preparation of new drugs or dietary supplements aimed to improve health, prevent lifestyle diseases and act as a valid support for chronical diseases such as pain, metabolic and neurological disorders.

**Funding:** This research was funded by the University of Turin, local research grant number to M.E.M.

**Conflicts of Interest:** The author declares no conflict of interest.

**Abbreviations**

BCP (E)-β-caryophyllene

**References**

1. Gertsch, J.; Leonti, M.; Raduner, S.; Racz, I.; Chen, J.-Z.; Xie, X.-Q.; Altmann, K.-H.; Karsak, M.; Zimmer, A. Beta-caryophyllene is a dietary cannabinoid. *Proc. Natl. Acad. Sci. USA* **2008**, *105*, 9099–9104. [CrossRef] [PubMed]

2. Francomano, F.; Caruso, A.; Barbarossa, A.; Fazio, A.; La Torre, C.; Ceramella, J.; Mallamaci, R.; Saturnino, C.; Iacopetta, D.; Sinicropi, M.S. Beta-caryophyllene: A sesquiterpene with countless biological properties. *Appl. Sci.* **2019**, *9*, 9–19. [CrossRef]

3. Meza, A.; Lehmann, C. Betacaryophyllene–A phytocannabinoid as potential therapeutic modality for human sepsis? *Med. Hypotheses* **2018**, *110*, 68–70. [CrossRef] [PubMed]

4. Sharma, C.; Al Kaabi, J.M.; Nurulain, S.M.; Goyal, S.N.; Kamal, M.A.; Ojha, S. Polypharmacological properties and therapeutic potential of beta-caryophyllene: A dietary phytocannabinoid of pharmaceutical promise. *Curr. Pharm. Des.* **2016**, *22*, 3237–3264. [CrossRef]

5. Schmitt, D.; Levy, R.; Carroll, B. Toxicological evaluation of -caryophyllene oil: Subchronic toxicity in rats. *Int. J. Toxicol.* **2016**, *35*, 558–567. [CrossRef]
6. Oliveira, G.L.D.; Machado, K.C.; Machado, K.C.; da Silva, A.; Feitosa, C.M.; Almeida, F.R.D. Non-clinical toxicity of beta-caryophyllene, a dietary cannabinoid: Absence of adverse effects in female swiss mice. Regul. Toxicol. Pharmacol. 2018, 92, 338–346. [CrossRef] [PubMed]

7. Wu, C.; Jia, Y.; Lee, J.H.; Jun, H.J.; Lee, H.S.; Hwang, K.Y.; Lee, S.J. Trans-caryophyllene is a natural agonistic ligand for peroxisome proliferator-activated receptor-alpha. Bioorg. Med. Chem. Lett. 2014, 24, 3168–3174. [CrossRef] [PubMed]

8. Geddo, F.; Scandifflfio, R.; Antoniotti, S.; Cottone, E.; Querio, G.; Maffe, M.E.; Bovolin, P.; Gallo, M.P. Pipenig (r)-fl, a fluid extract of black pepper (Piper nigrum L.) with a high standardized content of trans-beta-caryophyllene, reduces lipid accumulation in 3t3-l1 preadipocytes and improves glucose uptake in c2c12 myotubes. Nutrients 2019, 11, 2788. [CrossRef] [PubMed]

9. Dhopeshwarkar, A.; Mackie, K. Cb2 cannabinoid receptors as a therapeutic target—what does the future hold? Mol. Pharmacol. 2014, 86, 430–437. [CrossRef] [PubMed]

10. Katsuyama, S.; Mizoguchi, H.; Kuwahata, H.; Komatsu, T.; Nagaoka, K.; Nakamura, H.; Bagetta, G.; Sakurada, T.; Sakurada, S. Involvement of peripheral cannabinoid and opioid receptors in -caryophyllene-induced anticoagulation. Eur. J. Pain 2013, 17, 664–675. [CrossRef]

11. Commission, E.; Decree Regulating the Use of Vegetable Substances and Preparations in Food Supplements, Replacing the Decree of the Minister for Health of 9 July 2012. Communication from the Commission—TRIS(2017) 01619 2017. Notification Number: 2017/276/I. Available online: https://ec.europa.eu/growth/tools-databases/tris/en/search?trisaction=search.detail&year=2017&num=276 (accessed on 6 September 2020).

12. Zhaleh, M.; Sohrabi, N.; Zangeneh, M.M.; Zangeneh, A.; Moradi, R.; Zhaleh, H. Chemical composition and antibacterial effects of essential oil of Rhus Coriaria fruits in the west of Iran (Kermanshah). J. Essent. Oil Bear. Plants 2018, 21, 493–501. [CrossRef]

13. Sameh, S.; Al-Sayed, E.; Labib, R.M.; Singab, A.N.B. Comparative metabolic profiling of essential oils from Spondias Pinnata (linn. F.) kurz and characterization of their antibacterial activities. Ind. Crop Prod. 2019, 137, 468–474. [CrossRef]

14. Kossouoh, C.; Moudachirou, M.; Adjakidje, V.; Chalchat, J.C.; Figueredo, G. Essential oil chemical composition of Annona Muricata L. Leaves from Benin. J. Essent. Oil Res. 2007, 19, 307–309. [CrossRef]

15. Andrade, E.H.A.; Oliveira, J.; Zoghbi, M.D.B. Volatiles of Anaxagorea Dolichocarpa Spreng. & sandw. and Annona Densicoma mart. growing wild in the state of para, Brazil. Flavour Frag. J. 2007, 22, 158–160.

16. Nebie, R.H.C.; Yameogo, R.T.; Belanger, A.; Sib, F.S. Chemical composition of leaf essential oil of Annona Senegalensis pers. from Burkina Faso. J. Essent. Oil Res. 2005, 17, 331–332. [CrossRef]

17. Garg, S.N.; Gupta, D. Composition of the leaf oil of Annona squamosa L. from the north Indian plains. J. Essent. Oil Res. 2005, 17, 257–258. [CrossRef]

18. Phan, G.M.; Phan, S.T.; Konig, W.A. Chemical composition of the flower essential oil of Artabotrys Hexapetalus (L. F.) bianharae of Vietnam. J. Essent. Oil Res. 2007, 19, 523–524. [CrossRef]

19. Brophy, J.; Goldsack, R.; Forster, P. Essential oils from the leaves of some queensland Annonaceae. J. Essent. Oil Res. 2004, 16, 95–100. [CrossRef]

20. Ouattara, Z.A.; Boti, J.B.; Ahibo, C.A.; Tomi, F.; Casanova, J.; Bighelli, A. Chemical composition of the oil of Clestopholis Glaucia Pierre ex engler & diels from Cote d’Ivoire. J. Essent. Oil Res. 2012, 24, 471–474.

21. Hoferl, M.; Dai, D.N.; Thang, T.D.; Jirovetz, L.; Schmidt, E. Leaf essential oils of six vietnamese species of Fissistigma (Annonaceae). Nat. Prod. Commun. 2013, 8, 663–665. [CrossRef]

22. Thang, T.D.; Dai, D.N.; Ogunwande, I.A. Identification of the volatile compounds in the leaf and stem bark of three Goniothalamus species from Vietnam. J. Essent. Oil Bear. Plants 2016, 19, 743–749. [CrossRef]

23. Brophy, J.J.; Goldsack, R.J.; Forster, P.I. The leaf oils of the queensland species of Melodorum (Annonaceae). J. Essent. Oil Res. 2004, 16, 483–486. [CrossRef]

24. Brophy, J.J.; Goldsack, R.J.; Forster, P.I. The leaf oils of the australian species of Miliusa (Annonaceae). J. Essent. Oil Res. 2004, 16, 253–255. [CrossRef]

25. Ouattara, Z.A.; Boti, J.B.; Ahibo, C.A.; Bekro, Y.A.; Casanova, J.; Tomi, F.; Bighelli, A. Composition and chemical variability of Ivorian Polyalthia Oliveri leaf oil. Chem. Biodivers. 2016, 13, 293–298. [CrossRef] [PubMed]

26. Brophy, J.J.; Goldsack, R.J.; Hook, J.M.; Fookes, C.J.R.; Forster, P.I. The leaf essential oils of the australian species of Pseudowurzia (Annonaceae). J. Essent. Oil Res. 2004, 16, 362–366. [CrossRef]
27. Boyorn, F.F.; Zollo, P.H.A.; Aagnaniet, H.; Menut, C.; Bessiere, J.M. Aromatic plants of tropical Central Africa. XI. Essential oils from Uvariodendron Calophyllum re fries growing in cameron. *J. Essent. Oil Res.* 2005, 17, 128–129.

28. Lazarevic, J.; Radulovic, N.; Palic, R.; Zlatkovic, B. Chemical analysis of volatile constituents of Berula Erecta (Hudson) Corville Subsp Erecta (Apiaceae) from Serbia. *J. Essent. Oil Res.* 2010, 22, 153–156. [CrossRef]

29. Kurkcuoglu, M. Essential oil composition from fruits and aerial parts of Bilacunaria anatolica a. Duran (Apiaceae) endemic in Turkey. *J. Essent. Oil Bear. Plants*. 2016, 19, 379–383. [CrossRef]

30. Oyedeji, O.A.; Afolayan, A.J. Chemical composition and antibacterial activity of the essential oil of Centella Asiatica growing in South Africa. *Pharmac. Biol.* 2005, 43, 249–252. [CrossRef]

31. Oyedeji, O.A.; Afolayan, A.J. Chemical composition and antibacterial activity of the essential oil of Centella Asiatica growing in South Africa. *Pharmac. Biol.* 2005, 43, 249–252. [CrossRef]

32. Askari, F.; Teimouri, M.; Sefidkon, F. Chemical composition and antimicrobial activity of Pimpinella kotschyanoides. Oil in Iran. *J. Essent. Oil Bear. Plants*. 2011, 14, 124–130. [CrossRef]

33. Aspidozperma cylindrocarpon. Essential oil composition of three umbelliferae herbs: Azilia Eryngioedes (pau) hedge et lamond, Laser Trilobum (L.) borkh. and Falcaria Falcarioideceae from Australia. *Aust. J. Bot.* 2000, 51, 497–501. [CrossRef]

34. Sahebkar, A.; Iranshahi, M. Volatile constituents of the genus ferula (Apiaceae): A review. *J. Essent. Oil Bear. Plants*. 2011, 14, 504–531. [CrossRef]

35. Kucukboyaci, N.; Demirci, B.; Adiguzel, N.; Bani, B.; Baser, K.H.C. Volatile compounds from the aerial part and fruits of Grammosciadium Pterocarpum. *J. Essent. Oil Res.* 2004, 17, 98–100. [CrossRef]

36. Zhang, H.M.; Guo, S.S.; Fan, B.; Du, S.S.; Wang, Y.Y.; Deng, Z.W. Evaluation of efficacy of the essential oil from Ostericum Viridiflorum (turcz.) kitagawa in control of stored product insects. *Environ. Sci. Pollut. Res.* 2019, 26, 1406–1413. [CrossRef]

37. Askari, F.; Teimouri, M.; Sefidkon, F. Chemical composition and antimicrobial activity of Pimpinella kotschyanoides. Oil in Iran. *J. Essent. Oil Bear. Plants*. 2011, 14, 124–130. [CrossRef]

38. Aspidozperma cylindrocarpon. Essential oil composition of three umbelliferae herbs: Azilia Eryngioedes (pau) hedge et lamond, Laser Trilobum (L.) borkh. and Falcaria Falcarioideceae from Australia. *Aust. J. Bot.* 2000, 51, 497–501. [CrossRef]

39. Zhang, H.M.; Guo, S.S.; Fan, B.; Du, S.S.; Wang, Y.Y.; Deng, Z.W. Evaluation of efficacy of the essential oil from Ostericum Viridiflorum (turcz.) kitagawa in control of stored product insects. *Environ. Sci. Pollut. Res.* 2019, 26, 1406–1413. [CrossRef]

40. Zhang, H.M.; Guo, S.S.; Fan, B.; Du, S.S.; Wang, Y.Y.; Deng, Z.W. Evaluation of efficacy of the essential oil from Ostericum Viridiflorum (turcz.) kitagawa in control of stored product insects. *Environ. Sci. Pollut. Res.* 2019, 26, 1406–1413. [CrossRef]

41. Askari, F.; Teimouri, M.; Sefidkon, F. Chemical composition and antimicrobial activity of Pimpinella kotschyanoides. Oil in Iran. *J. Essent. Oil Bear. Plants*. 2011, 14, 124–130. [CrossRef]

42. Mazloomifar, H.; Bigdeli, M.; Saber-Tehrani, M.; Rustaiyan, A.; Masoudi, S.; Ameri, N. Essential oil of Prangos Uloptera. *J. Essent. Oil Res.* 2004, 16, 415–416. [CrossRef]

43. Shafaghat, A. Comparison of chemical composition of essential oil and n-hexane extracts of Zosimia absinthifolia (vent.) link. *J. Essent. Oil Bear. Plants*. 2011, 14, 490–493. [CrossRef]

44. Maia, J.G.S.; Zoghbi, M.B.; Andrade, E.H.A.; Carreira, L.M.M. Volatiles from flowers of Thevetia Peruviana (pers.) k. Schum. and Allamanda catharticae. *Apopynaceae*. *J. Essent. Oil Res.* 2000, 12, 322–324. [CrossRef]

45. Cornelio, M.L.; Lago, J.H.G.; Moreno, P.R.H. Volatile oil composition of Aspidosperma Cylindrocarpon. *J. Essent. Oil Res.* 2005, 17, 310–311. [CrossRef]

46. Boligon, A.A.; Schwanz, T.G.; Piana, M.; Bandeira, R.V.; Frohlich, J.K.; de Brum, T.F.; Zadra, M.; Athayde, M.L. Chemical composition and antioxidant activity of the essential oil of Tabernanontana Catharinensis a. DC. *Leaves. Nat. Prod. Res.* 2013, 27, 68–71. [CrossRef]
47. Sabulal, B.; George, V.; Pradeep, N.S.; Dan, M. Volatile oils from the root, stem and leaves of *Schefflera Stellata* (gaertn.) harms (*araliaceae*): Chemical characterization and antimicrobial activity. *J. Essent. Oil Res.* 2008, 20, 79–82. [CrossRef]

48. Vila, R.; Mundina, M.; Muschietti, L.; Priestap, H.A.; Bandoni, A.L.; Adzet, T.; Canigueral, S. Volatile constituents of leaves, roots and stems from aristolochia elegans. *Phytochemistry* 1997, 46, 1127–1129. [CrossRef]

49. Su, X.D.; Gao, Y.; Xiang, Y.X.; Lai, P.X.; Xing, X. Chemical composition and biological activities of the essential oil from *Aristolochia Fordiana* hemsl. *Rec. Nat. Prod.* 2019, 13, 346–354.

50. Simic, N.; Palić, R.; Vajs, V.; Milosavljevic, S.; Djokovic, D. Composition and antibacterial activity of *Achillea Asplenifolia* essential oil. *J. Essent. Oil Res.* 2002, 14, 76–78. [CrossRef]

51. Rodrigues, R.A.F.; Queiroga, C.L.; Rodrigues, M.V.N.; Foglio, M.A.; Sartoratto, A.; Montanari, I. Study of the variation of the composition of the essential oil of leaves and flowers of *Achyrocline Alata* (dc) along a period of the day. *J. Essent. Oil Res.* 2002, 14, 280–281. [CrossRef]

52. Norouzi-Arasi, H.; Yavari, I.; Chalabian, F.; Kiarostami, V.; Ghasemi, A. Chemical composition of the essential oils of *Ageratum conyzoides* from s. Tome and principe. *J. Essent. Oil Res.* 2005, 17, 239–242. [CrossRef]

53. Juteau, F.; Masotti, V.; Viano, J.; Bessiere, J.M. Chemical variation in the oil of *Artemisia Verlotiorum lamotte* of french origin harvested at a vegetative stage and during flowering. *J. Essent. Oil Res.* 2005, 17, 254–256. [CrossRef]

54. Novakovic, J.; Rajcevic, N.; Garcia-Jacas, N.; Susanna, A.; Marin, P.D.; Janackovic, P. Essential oil composition of seven *centaurea* species (sect. *Acrocentron*, *asteraceae*)—Taxonomic implication and ecological significance. *Biochem. Syst. Ecol.* 2019, 83, 83–90. [CrossRef]

55. Haider, F.; Kumar, N.; Banerjee, S.; Naqvi, A.A.; Bagchi, G.D. Composition and antibacterial activity of the essential oil of *Asteraceae* species (sect. *Acrocentron*, *asteraceae*). *J. Essent. Oil Res.* 2009, 21, 348–350. [CrossRef]

56. Manika, N.; Chanotiya, C.S.; Darokar, M.; Singh, S.; Das Bagchi, G. Compositional characters and antimicrobial potential of *Artemisia Stricta* edgew. *F. Stricta* pamp. Essential oil. *Rec. Nat. Prod.* 2016, 10, 40–46.

57. Cha, J.D.; Jeong, M.R.; Jeong, S.I.; Moon, S.E.; Kim, J.Y.; Kil, B.S.; Song, Y.H. Chemical composition and antimicrobial activity of the essential oils of *Artemisia Scoparia* from s. Tome and principe. *J. Essent. Oil Res.* 2005, 17, 303–304. [CrossRef]

58. Gbolade, A.A.; Dzamic, A.; Marin, P.D.; Ristic, M. Essential oil constituents of *Aspilia Africana* (pers.) c. D. Adams leaf from Nigeria. *J. Essent. Oil Res.* 2009, 21, 348–350. [CrossRef] [PubMed]

59. Zollo, P.H.A.; Kuiate, J.R.; Menut, C.; Lamaty, G.; Bessiere, J.M.; Chalchat, J.C.; Garry, R.P. Aromatic plants of tropical central Africa. Part xx. The occurrence of 1-phenylhepta-1,3,5-triyne in the essential oil of bidens pilosa L. *Flavour Frag. J.* 1995, 10, 97–100. [CrossRef]

60. Cha, J.D.; Jeong, M.R.; Choi, H.J.; Jeong, S.; Moon, S.E.; Yun, S.; Kim, Y.H.; Kil, B.S.; Song, Y.H. Chemical composition and antimicrobial activity of the essential oil of *Artemisia Lavandulaefolia*. *Planta Med.* 2005, 71, 575–577. [CrossRef]

61. Yayli, N.; Yasar, A.; Albay, C.; Asamaz, Y.; Coskuncelebi, K.; Karaoglu, S. Chemical composition and antimicrobial activity of essential oils from *Centaurea Appendicigera* and *Centaurea Helenioides*. *Pharm. Biol.* 2009, 47, 7–12. [CrossRef]
67. Oggunwande, I.A.; Olawore, N.O.; Usman, L. Composition of the leaf oil of Cenchratherum Punctatum cass. Growing in Nigeria. *J. Essent. Oil Res.* 2005, 17, 496–498. [CrossRef]

68. Koba, K.; Nenonone, A.Y.; Catherine, G.; Raynaud, C.; Chaumont, J.P.; Sanda, K.; Laurence, N. Chemical composition and cytotoxic activity of essential oil of Chromolaena Odorata L. Growing in Togo. *J. Essent. Oil Bear. Plants* 2011, 14, 423–429. [CrossRef]

69. Maia, J.G.S.; da Silva, M.H.L.; Zoegbhi, M.D.B.; Andrade, E.H.A. Composition of the essential oils of Conyza Bonarisemis (L.) cronquist. *J. Essent. Oil Res.* 2002, 14, 325–326. [CrossRef]

70. Boue, G.B.; Boti, J.B.; Tonzibo, Z.E.; Paoli, M.; Bighelli, A. New trans-beta-bergamotene derivatives in the root and the flower essential oils of Cyanthillium Cinereum (L.) h. Rob. From cote d’Ivoire. *Nat. Prod. Res.* 2019, 33, 2795–2800. [CrossRef]

71. Zhang, W.J.; You, C.X.; Yang, K.; Wang, Y.; Su, Y.; Geng, Z.F.; Du, S.S.; Wang, C.F.; Deng, Z.W.; Wang, Y.Y. Bioactivity and chemical constituents of the essential oil from Dendranthema Indicum (L.) des moul. Against two stored insects. *J. Oleo Sci.* 2015, 64, 553–560. [CrossRef]

72. Joshi, R.K. Volatile constituents of *Emilia Sonchifolia* from India. *Nat. Prod. Commun.* 2018, 13, 1355–1356. [CrossRef]

73. Idrissa, M.; Djibo, A.K.; Khalid, I.; Marie, B.J. The essential oil of Epaltes Alata (compositae). *Flavour Frag. J.* 2005, 20, 203–204. [CrossRef]

74. Pinto, A.P.R.; Seibert, J.B.; dos Santos, O.D.H.; Vieira, S.A.; do Nascimento, A.M. Chemical constituents and allelopathic activity of the essential oil from leaves of Eremanthus Erythropappus. *Aust. J. Bot.* 2018, 66, 601–608. [CrossRef]

75. Rahman, A.; Hossain, M.A.; Kang, S.C. Control of phytopathogenic fungi by the essential oil and methanolic extracts of Erigeron Ramosus (walt.) bsp. *Eur. J. Plant Pathol.* 2010, 128, 211–219. [CrossRef]

76. Vilejoen, A.M.; Njenga, E.W.; van Vuuren, S.F.; Paoli, M.; Bighelli, A. New trans-beta-bergamotene derivatives in the root and the flower essential oils of Cyanthillium Cinereum (L.) h. Rob. From cote d’Ivoire. *Nat. Prod. Res.* 2019, 33, 2795–2800. [CrossRef]

77. Zhang, W.J.; You, C.X.; Yang, K.; Wang, Y.; Su, Y.; Geng, Z.F.; Du, S.S.; Wang, C.F.; Deng, Z.W.; Wang, Y.Y. Bioactivity and chemical constituents of the essential oil from Dendranthema Indicum (L.) des moul. Against two stored insects. *J. Oleo Sci.* 2015, 64, 553–560. [CrossRef]

78. Roussin, E.; Aouadi, W.; Mezzar, M.; Rabhi, L. Essential oil from *Kochia prostrata* (Asteraceae) growing in Tunisia. *J. Essent. Oil Res.* 2005, 17, 427–428. [CrossRef]

79. Couch, V.H.; Bessiere, J.M. Composition and antimicrobial activity of the essential oil of *Eremanthus Erythropappus* and allelopathic activity of the essential oil from leaves of *Eremanthus Erythropappus*. *Aust. J. Bot.* 2018, 66, 601–608. [CrossRef]

80. Fofana, H.; Bessiere, J.M.; Payo, A.; Martinez, M.; Marian, M. Bioactivity and chemical composition of the essential oil from leaves of *Eremanthus Erythropappus*. *Aust. J. Bot.* 2018, 66, 601–608. [CrossRef]

81. Kuiate, J.R.; Bessiere, J.M.; Zoghbi, M.D.B.; Andrade, J.M. Composition of the essential oils from three *Ocimum gratissimum* (L.) sw. var. *O. Gratissimum* growing in Senegal. *J. Essent. Oil Res.* 2005, 17, 105–108. [CrossRef]

82. Petasites Japonicus* from Costa Rica. *Rec. Nat. Prod.* 2012, 6, 371–375. [CrossRef]

83. Miyazawa, M.; Teranishi, A.; Ishikawa, Y. Components of the essential oil from *Petasites japonicus*. *Flavour Frag. J.* 2003, 18, 231–233. [CrossRef]
88. Kerdudo, A.; Gonnot, V.; Ellong, E.N.; Boyer, L.; Chandre, F.; Adenet, S.; Rochefort, K.; Michel, T.; Fernandez, X. Composition and bioactivity of Pluchea Carolinensis (jack.) g. Essential oil from Martinique. *Ind. Crop Prod.* 2016, 89, 295–302. [CrossRef]

89. Labuckas, D.O.; Zygdilé, J.A.; Espinar, L.A. Constituents of the volatile oil of Porophyllum Obscurum (spreng.) dc. *Flavour Frag. J.* 1999, 14, 107–108. [CrossRef]

90. Zhu, X.W.; Zhang, X.H.; Chen, J.H.; Zhu, X.W.; Tan, J.C.; Chen, H.X.; Wan, F.H. Chemical composition of leaf essential oil from Solidago Decurrens lour. *J. Essent. Oil Res.* 2009, 21, 354–356. [CrossRef]

91. Szarka, S.; Hethelyi, E.; Lemberkovics, E.; Kuzovkina, I.N.; Banyai, P.; Szoke, E. GC and gc-ms studies on the essential oil and thiophenes from *Tagetes Patula* L. *Chromatographia* 2006, 63, S67–S73. [CrossRef]

92. Sefidkon, F.; Salehyar, S.; Mirza, M.; Dabiri, M. The essential oil of *Tagetes Erecta* L. Occurring in Iran. *Flavour Frag. J.* 2004, 19, 579–581. [CrossRef]

93. Shafaghat, A. Antibacterial activity and sesquiterpenoid contents of the essential oil of *Tanacetum Punctatum* (desr.) grierson. *J. Essent. Oil. Bear. Plants* 2015, 28, 199–204. [CrossRef]

94. Nanyonga, S.K.; Opoku, A.R.; Lewu, F.B.; Oyedeji, A.O. The chemical composition, larvicidal and antibacterial activities of the essential oil of *Tarchonanthus Trilobus var galpinii*. *J. Essent. Oil Res.* 2013, 16, 524–530. [CrossRef]

95. Sobrinho, A.C.N.; dos Santos, H.S.; de Morais, S.M.; Cavalcante, C.S.D.; de Souza, E.B.; de Sousa, H.A.; Albuquerque, M.; Fontenelle, R.O.D. Antifungal and antioxidant activities of *Vernonia Chalybaea* mart. Ex dc. Essential oil and their major constituent beta-caryophyllene. *Braz. Arch. Biol. Technol.* 2020, 63, 11.

96. Albuquerque, M.; Lemos, T.L.G.; Pessoa, O.D.L.; Nunes, E.P.; Nascimento, R.F.; Silveira, E.R. Chemical composition of the essential oil from *Vernonia Scorpioides* (asteraceae). *Flavour Frag. J.* 2007, 22, 249–250. [CrossRef]

97. Parveen, Z.; Mazhar, S.; Siddique, S.; Manzoor, A.; Ali, Z. Chemical composition and antifungal activity of essential oil from *Xanthium Strumarium* L. *Leaves*. *Indian J. Pharm. Sci.* 2017, 79, 316. [CrossRef]

98. Uquiche, E.L.; Toro, M.T.; Quevedo, R.A. Supercritical extraction with carbon dioxide and co-solvent from *Leptocarpha Rivularis*. *J. Appl. Res. Med. Aromat. Plants* 2019, 14, 8. [CrossRef]

99. Brophy, J.J.; Forster, P.I.; Goldsack, R.J. Characterization of essential oils from the leaves of the genus *daphnandra* (atherospermataceae). *J. Essent. Oil Res.* 2016, 28, 339–347. [CrossRef]

100. Diniz, J.C.; Viana, F.A.; de Oliveira, O.F.; Silveira, E.R.; Pessoa, O.D.L. Chemical composition of the leaf essential oil of *Cordia Leucocephala* moric from north-east of Brazil. *J. Essent. Oil Res.* 2008, 20, 495–496. [CrossRef]

101. Das Gracas, M.; Zoghibi, B.; Andrade, E.H.A.; Pereira, R.A.; Oliveira, J. Volatiles of the Cordia Multispicata cham.: A weed medicinal Brazilian plant. *J. Essent. Oil. Res.* 2010, 22, 543–545. [CrossRef]

102. Junor, G.A.O.; Porter, R.B.R.; Yee, T.H.; Waugh, T. The volatile constituents from the leaves, bark and fruits of *Bursera Aromatica* (proctor) found in Jamaica. *J. Essent. Oil Res.* 2010, 22, 19–22. [CrossRef]

103. Tucker, A.O.; Maciarelo, M.J.; Brown, R.C.; Landrum, L.R.; Lafferty, D. Essential oils from the oleo-gum-resins of elephant tree or torote (*Bursera Microphylla* a. *Gray*, *burseraceae*) from Arizona. *J. Essent. Oil Res.* 2009, 21, 57–58. [CrossRef]

104. Thang, T.D.; Dai, D.N.; Luong, N.X.; Ogunwande, I.A. Constituents of essential oils from the leaves, stem barks and resins of *Canarium Parvum leen.*, and *Canarium Tramdenanum dai et yakovl.* (*burseraceae*) grown in vietnam. *Nat. Prod. Res.* 2014, 28, 461–466. [CrossRef]

105. Onocha, P.A.; Ekundayo, O.; Oyelola, O.; Laasko, I. Essential oils of *Daeryodes Edulis* (g.Don) h. J. Lam (african pear). *Flavour Frag. J.* 1999, 14, 135–139. [CrossRef]

106. Bandeira, P.N.; Machado, M.L.; Cavalcanti, F.S.; Lemos, T.L.G. Essential oil composition of leaves, fruits and resin of *Protium Heptaphyllum* (aul.) march. *J. Essent. Oil Res.* 2001, 13, 33–34. [CrossRef]

107. Novak, J.; Franz, C. Composition of the essential oils and extracts of two populations of *Cannabis Sativa* L. *Sp spontanea* from Austria. *J. Essent. Oil Res.* 2003, 15, 158–160. [CrossRef]

108. Benelli, G.; Pavela, R.; Petrelli, R.; Cappellacci, L.; Santini, G.; Fiorini, D.; Sut, S.; Dall’Acqua, S.; Canale, A.; Maggi, F. The essential oil from industrial hemp (*Cannabis Sativa*) by-products as an effective tool for insect pest management in organic crops. *Ind. Crop Prod.* 2018, 122, 308–315. [CrossRef]

109. Goncalves, J.; Figueria, J.; Rodrigues, F.; Camara, J.S. Headspace solid-phase microextraction combined with mass spectrometry as a powerful analytical tool for profiling the terpenoid metabolomic pattern of hop-essential oil derived from saaz variety. *J. Sep. Sci.* 2012, 35, 2282–2296. [CrossRef]
110. Poralijan, V.; Rad, A.S. Extraction of eugenol from carnation: A quantitative and qualitative analysis by aqueous and ethanolic solvents. *J. Essent. Oil Bear. Plants* **2016**, *19*, 1495–1502. [CrossRef]

111. Mendiratta, A.; Dayal, R.; Bartley, J.R. Ge/ms analysis of essential oils of needles and twigs of *Cephalotaxus Harringtonia* (knight ex forbes) koch var. Harringtonia. *J. Essent. Oil Res.* **2005**, *17*, 308–309. [CrossRef]

112. De Oliveira, J.C.S.; Neves, I.A.; da Camara, C.A.G.; Schwartz, M.O.E. Volatile constituents of the fruits of *Clusia Nemorosa* G. Mey. From different region of Atlantic coast restings of pernambuco (northeast of Brazil). *J. Essent. Oil Res.* **2008**, *20*, 219–222. [CrossRef]

113. Tan, W.N.; Wong, K.C.; Khairuddean, M.; Eldeen, I.M.; Asmawi, M.Z.; Sulaiman, B. Volatile constituents of *Garcinia Atroviridis* and their antibacterial and anti-inflammatory activities. *Flavour Frag. J.* **2013**, *28*, 2–9. [CrossRef]

114. Andrade, M.S.; Sampaio, T.S.; Nogueira, P.C.L.; Ribeiro, A.S.; Bittrich, V.; Amaral, M.D.E. Volatile compounds of the leaves, flowers and fruits of *Kielmeya Rugosa choisy (clusiaceae).* *Flavour Frag. J.* **2007**, *22*, 49–52. [CrossRef]

115. Zubair, M.F.; Oladosu, I.A.; Olawore, N.O. Chemical composition of the leaf oil of *Psorospermum Corynabiferum* hochr. Growing in Africa. *J. Essent. Oil Res.* **2010**, *22*, 529–530. [CrossRef]

116. Dehghan, H.; Sarrafi, Y.; Salehi, P. Chemical composition of the essential oil of *Convululus Persicus* L. *J. Essent. Oil Bear. Plants* **2015**, *18*, 592–595. [CrossRef]

117. Boudarene, L.; Rahim, L.; Baalouamer, A.; Meklati, B.Y. Analysis of Algerian essential oils from twigs, needles and wood of *Cedrus Atlantica* g. Manetti by gc/ms. *J. Essent. Oil Res.* **2004**, *16*, 531–534. [CrossRef]

118. Boudarene, L.; Rahim, L.; Baaliouamer, A.; Meklati, B.Y. Analysis of Algerian essential oils from twigs, needles and wood of *Cedrus Atlantica* g. Manetti by gc/ms. *J. Essent. Oil Res.* **2004**, *16*, 531–534. [CrossRef]

119. Tort, N.S.; Demiray, H.; Guvensen, A.; Dereboylu, A.E. Chemical composition of essential oils of berries of *Juniper Us Macrocarpa sibth. & sm.* From Turkey. *Bangladesh J. Bot.* **2019**, *48*, 339–343. [CrossRef]

120. Elsharkawy, E.R.; Aljohar, H.; Donia, A. Comparative study of antioxidant and anticaner activity of *Thuja Orientalis* growing in Egypt and Saudi Arabia. *Br. J. Pharm. Res.* **2017**, *15*, 9. [CrossRef]

121. Lazarevic, J.; Radulovic, N.; Palic, R.; Zlatkovic, B. Chemical composition of the essential oil of *Cyperus Glomeratus* L. *J. Essent. Oil Res.* **2010**, *22*, 578–581. [CrossRef]

122. Queiroz, T.B.; da Fonseca, E.S.A.; Mendes, A.D.R.; Azevedo, A.M.; Martins, E.R. Chemical diversity of accessions of the in vivo germplasm bank of *Varronia Curassavica* (jacq.). *Acta Sci. Agron.* **2020**, *42*, 11. [CrossRef]

123. Scotto, C.I.; Burger, P.; el Khil, M.K.; Ginouves, M.; Prevot, G.; Blanchet, D.; Delprete, P.G.; Fernandez, X. Chemical composition and antifungal activity of the essential oil of *Varronia Schomburgkii* (dc.) borhidi (cardiaceae) from plants cultivated in French Guiana. *J. Essent. Oil Res.* **2017**, *29*, 304–312. [CrossRef]

124. Deepaa, C.V.; Chalchat, J.C.; John, J.A. Chemical composition of the essential oil from the leaves of *Acalypha Fruticosa*. *J. Essent. Oil Bear. Plants* **2012**, *15*, 609–613. [CrossRef]

125. Nguyen, A.D.; Tran, D.T.; Hong, V.; Nguyen, X.D. Volatile constituents of the leaf oil of *Alchornea Tiliifolia* (benth.) muell. (family euphorbiaceae) from plants cultivated in French Guiana. *J. Essent. Oil Res.* **2017**, *29*, 304–312. [CrossRef]

126. De Oliveira, L.F.; Damasceno, C.S.; Campos, R.; de Souza, A.M.; Mendes, G.; Dias, J.D.G.; Miguel, O.G.; Miguel, M.D. Chemical composition of the volatile oil of *Croton Glandulosus limaeus* and its allelopathic activity. *Nat. Prod. Res.* **2020**, *4*, 1–4. [CrossRef]

127. De Oliveira, L.F.; Damasceno, C.S.; Campos, R.; de Souza, A.M.; Mendes, G.; Dias, J.D.G.; Miguel, O.G.; Miguel, M.D. Chemical composition of the volatile oil of *Croton Glandulosus limaeus* and its allelopathic activity. *Nat. Prod. Res.* **2020**, *4*, 1–4. [CrossRef]

128. Doria, G.A.A.; Silva, W.J.; Carvalho, G.A.; Alves, P.B.; Cavalcanti, S.C.H. A study of the larvicidal activity of two croton species from northeastern Brazil against *Aedes Aegypti*. *Pharm. Biol.* **2010**, *48*, 615–620. [CrossRef]

129. Eresanya, O.I.; Awoleye, O.N.; Ogunwande, I.A.; Lawal, O.A.; Giwa-Ajeniya, A.F. Chemical constituents of essential oil from the leaves of *Phyllanthus Muellerianus* (o. Kuntze) exell. *J. Essent. Oil Bear. Plants* **2019**, *22*, 865–870. [CrossRef]

130. Da Silva, K.L.C.; da Silva, M.M.C.; de Moraes, M.M.; da Camara, C.A.G.; Santos, M.L.; Fagg, C.W. Chemical composition and acaricidal activity of essential oils from two species of the genus bauhinia that occur in the cerrado biome in Brazil. *J. Essent. Oil Res.* **2020**, *32*, 93–101. [CrossRef]
131. Rodrigues, M.O.; Alves, P.B.; Nogueira, P.C.L.; Machado, S.M.F.; Moraes, V.R.S.; Ribeiro, A.D.; Silva, E.S.; Feitosa, J.G.R. Volatile constituents and antibacterial activity from seeds of Bovlíchia Virgiliioides kunt. J. Essent. Oil Res. 2009, 21, 286–288. [CrossRef]
132. Miyazawa, M.; Nagata, T.; Nakahashi, H.; Takahashi, T. Characteristic odor components of essential oil from Caesalpinia Decapetala. J. Essent. Oil Res. 2012, 24, 441–446. [CrossRef]
133. De Oliveira, L.G.S.; Ribeiro, D.A.; Saraiva, M.E.; de Macedo, D.G.; Macedo, J.G.F.; Pinheiro, P.G.; da Costa, J.G.M.; Souza, M.M.D.; de Menezes, I.R.A. Chemical variability of essential oils of Copaifera Langsdorffii desf. In different phenological phases on a savannah in the northeast, Ceara, Brazil. Ind. Crop Prod. 2017, 97, 455–464. [CrossRef]
134. Veiga, V.F.; Rosas, E.C.; Carvalho, M.V.; Henriques, M.; Pinto, A.C. Chemical composition and anti-inflammatory activity of copaiba oils from Copaifera Cearensis Huber Ex Ducke, Copaifera Reticulata ducke and Copaifera Multijuga hayne—A comparative study. J. Ethnopharmacol. 2007, 112, 248–254. [CrossRef] [PubMed]
135. Zoghbi, M.D.B.; Andrade, E.H.A.; Martins-da-Silva, R.C.V.; Trigo, J.R. Chemical variation in the volatiles of Copaifera Reticulata ducke (leguminosae) growing wild in the states of para and amapa, Brazil. J. Essent. Oil Res. 2009, 21, 501–503. [CrossRef]
136. Munoz-Acvedo, A.; Gonzalez, M.D.; Stashenko, E.E. Volatile fractions and essential oils of the leaves and branches of Dalia Carthagagensis (jacq.) f.f macbr. From northern region of colombia. J. Essent. Oil Bear. Plants 2019, 22, 774–788. [CrossRef]
137. Leandro, L.M.; Da Veiga, V.F.; Sales, A.P.B.; Pessoa, C.D. Chemical composition and cytotoxic activity of essential oils from the leaves and stems of Eperua Dukeana cowan. Boletin Latinoamericano Y Del Caribe de Plantas 2015, 14, 42–47.
138. Shakeri, A.; Akhtari, J.; Soheili, V.; Taghizadeh, S.F.; Sahebkar, A.; Shaddel, R.; Asili, J. Identification and biological activity of the volatile compounds of Glycyrrhiza Triphylla fisch & cayem. Microb. Pathog. 2017, 109, 39–44.
139. Bertoli, A.; Menichini, F.; Noccioli, C.; Morelli, L.; Pestelli, L. Volatile constituents of different organs of Psoralea bituminosa L. Flavour Frag. J. 2004, 19, 166–171. [CrossRef]
140. Mwangi, J.W.; Thoithi, G.N.; Kibwage, I.O.; Demo, M.S.; Oliva, M.M.; Zunino, M.R.; Zygadlo, J.A. Essential oil of Rynchosia Minima ff. J. Essent. Oil Res. 2009, 21, 376–378. [CrossRef]
141. Tewari, K.; Pande, C.; Kharkwal, G.C.; Punetha, D. Volatile constituents of different phenological phases on a savannah in the northeast, Ceara, Brazil. J. Essent. Oil Res. 2012, 24, 318–326. [CrossRef]
142. Sousa, F.G.; Schneider, N.F.Z.; Mendes, C.E.; de Moura, N.F.; Denardin, R.B.N.; Matuo, R.; Mantovani, M.S. Clastogenic and anticlastogenic effect of the essential oil from Casearia Sylvesteri swart. J. Essent. Oil Res. 2007, 19, 376–378. [CrossRef]
143. Tewari, K.; Pande, C.; Tewari, G.; Kharkwal, G.C.; Punetha, D. Volatile constituents of Geranium Wallichianum d. Don ex weet. From north-western Himalayan region. J. Indian Chem. Soc. 2015, 92, 123–125.
144. Scramin, S.; Saito, M.L.; Pott, A.; Marques, M.O.M. Essential oil of Elyonurus Muticus (sprengel) o.Kuntze (guttiferae). J. Essent. Oil Res. 2000, 12, 298–300. [CrossRef]
145. Kimani, S.M.; Chhabra, S.C.; Lwande, W.; Khan, Z.R.; Hassanali, A.; Pickett, J.A. Airborne volatiles from Melinis Minutiflora p. Beauv., a non-host plant of the spotted stem borer. J. Essent. Oil Res. 2000, 12, 221–224. [CrossRef]
146. Brophy, J.J.; Goldsack, R.J.; Forster, P.I. Leaf essential oils of the australian species of gyrocarpus and hernandia (herbidaeae). J. Essent. Oil Res. 2000, 12, 717–722. [CrossRef]
147. Abreu, L.N.; Reis, M.G.; Marsaioli, A.J.; Mazzafera, P. Essential oil composition of Hypericum Brasiliense choise. Flavour Frag. J. 2004, 19, 80–82. [CrossRef]
148. Ghiasvand, A.; Shadabi, S.; Hajipour, S.; Nasirian, A.; Borzouei, M.; Hassan-Moghadam, E.; Hashemi, P. Comparison of ultrasound-assisted headspace solid-phase microextraction and hydrodistillation for the identification of major constituents in two species of hypericum. J. Chromatogr. Sci. 2016, 54, 264–270. [CrossRef]
149. Buitrago, A.; Rojas, L.B.; Rojas, J.; Buitrago, D.; Usubillaga, A.; Morales, A. Comparative study of the chemical composition of the essential oil of Visnia Baccifera var. Dealbata (guttiferae) collected in two different locations in Merida-Venezuela. J. Essent. Oil Bear. Plants 2009, 12, 651–655. [CrossRef]
172. Miceli, A.; Negro, C.; Tommasi, L. Essential oil of *Melissa romana* (miller) grown in southern Apulia (Italy). *J. Essent. Oil Res.* 2006, 18, 473–475. [CrossRef]

173. Nori-Shargh, D.; Norouzi-Arasi, H.; Mohammadi, S.; Mirza, M.; Jaimand, K. Volatile component of *Mentha longifolia* (L.) huds. From Iran. *J. Essent. Oil Res.* 2000, 12, 111–112. [CrossRef]

174. Sarikurkcu, C.; Ceylan, O.; Zeljkovic, S.C. *Micromeria nyjetifolia*: Essential oil composition and biological activity. *Nat. Prod. Commun.* 2019, 14, 3. [CrossRef]

175. Chen, X.B.; Chen, R.; Luo, Z.R. Chemical composition and insecticidal properties of essential oil from aerial parts of *mosla sochovensis* against two grain storage insects. *Trop. J. Pharm. Res.* 2017, 16, 905–910. [CrossRef]

176. Talebi, S.M.; Nohooji, M.G.; Yarmohammadi, M.; Khani, M.; Matsyura, A. Effect of altitude on essential oil composition and on glandular trichome density in three nepeta species (*N. Sessiliflora, N. Heliotropifolia* and *N. Fissa*). *Mediterr. Bot.* 2019, 40, 81–93. [CrossRef]

177. Brada, M.; Saadi, A.; Wathelet, J.P.; Lognay, G. The essential oils of *Origanum majorana* L. and *Origanum floribundum* munby in Algeria. *J. Essent. Oil Bear. Plants* 2012, 15, 497–502. [CrossRef]

178. Raina, A.P.; Kumar, A.; Dutta, M. Chemical characterization of aroma compounds in essential oil isolated from “holy basil” (*Ocimum tenuiflorum* L.) grown in India. *Genet. Resour. Crop Evol.* 2013, 60, 1727–1735. [CrossRef]

179. Senatore, F.; Arnold, N.A.; Pizzi, F. Composition of the essential oil of *nepea curviflora boiss. (lamiaceae)* from Lebanon. *J. Essent. Oil Res.* 2005, 17, 268–270. [CrossRef]

180. Joshi, R.K. Gc-ms analysis of the volatile constituents of *orthosiphon pallidus royle*, ex benth. *Nat. Prod. Res.* 2010, 34, 441–444. [CrossRef]

181. Ghimire, B.K.; Yoo, J.H.; Yu, C.Y.; Kim, S.H.; Chung, I.M. Profiling volatile and phenolic compound composition and characterization of the morphological and biological activities of *perilla frutescens* *britton* var. *Japonica* accessions. *Acta Physiol. Plant.* 2019, 41, 16. [CrossRef]

182. Amor, I.L.B.; Neffati, A.; Ben Sgaier, M.; Bhouri, W.; Boubaker, J.; Skandrani, I.; Bouhlel, I.; Kilani, S.; Ben Ammar, R.; Chraief, I.; et al. Antimicrobial activity of essential oils isolated from *phlomis crinita* cav. *Ssp mauritanica* munby. *J. Am. Oil Chem. Soc.* 2008, 85, 845–849. [CrossRef]

183. Demirci, B.; Baser, K.H.C.; Dadandi, M.Y. Composition of the essential oils of *phlomis rigida labill*. *Phlomis samia* L. *J. Essent. Oil Res.* 2006, 18, 328–331. [CrossRef]

184. Tennakoon, T.; Abeyesekera, A.M.; de Silva, K.T.D.; Padumadasa, C.; Wijesundara, D.S.A. Essential oil composition of *Platostoma menthoides* (L.) a. J. Paton whole plant. *J. Essent. Oil Bear. Plants* 2016, 19, 1516–1520. [CrossRef]

185. Tiwari, A.; Padalia, R.C.; Mathela, C.S. Sesquiterpene rich essential oil from *Plectranthus rugosus wall.* *J. Essent. Oil Bear. Plants* 2008, 11, 58–61. [CrossRef]

186. Hussien, J.; Hymete, A.; Rohloff, J. Volatile constituents and biological activities of *Pycnostachys Abyssinica* and *Pycnostachys Eminii* extracts. *Pharm. Biol.* 2010, 48, 1384–1391. [CrossRef]

187. Apostolides, N.A.; El Beyrouthy, M.; Dhifi, W.; Najem, W.; Labaki, M.; AbouKais, A. Chemical composition of aerial parts of *Rosmarinus Officinalis* L. Essential oil growing wild in Lebanon. *J. Essent. Oil Bear. Plants* 2013, 16, 274–282. [CrossRef]

188. Garcia-Rojas, A.; Fontecha-Garcia, J.; Peralta-Bohorquez, A.F.; Quijano-Celis, C.E.; Morales, G.; Pino, J.A. Composition of the essential oil from leaves and fruits of *Salvia Palaefolia kunth* grown in Colombia. *J. Essent. Oil Res.* 2010, 22, 369–370. [CrossRef]

189. Sefidkon, F.; Hooshidary, R.; Jamzad, Z. Chemical variation in the essential oil of *Salvia Bracteata banks & soland* from Iran. *J. Essent. Oil Bear. Plants* 2007, 10, 265–272.

190. Barazanbeh, M.M. Volatile constituents of the oil of *Salvia Hydrangea* dc. Ex benth. From Iran. *J. Essent. Oil Res.* 2004, 16, 20–21. [CrossRef]

191. Mirza, M.; Sefidkon, F. Essential oil composition of two salvia species from Iran, *Salvia Nemorosa* L. and *Salvia Reuterana boiss*. *Flavour Frag.* J. 1999, 14, 230–232. [CrossRef]

192. Sefidkon, F.; Mirza, M. Chemical composition of the essential oils of two salvia species from Iran, *Salvia Virgata jacq.* and *Salvia Syriaca L.* *Flavour Frag.* J. 1999, 14, 45–46. [CrossRef]
194. Vallejo, M.C.G.; Moujir, L.; Burillo, J.; Guerra, L.L.; Gonzalez, M.; Penate, R.D.; San Andres, L.; Luis, J.G.; Blanco, F.L.; de Galarreta, C.M.R. Chemical composition and biological activities of the essential oils of Salvia Canariensis. Flavour Frag. J. 2006, 21, 277–281. [CrossRef]

195. Abak, F.; Yildiz, G.; Atamov, V.; Kurkcuoglu, M. Composition of the essential oil of Salvia Monthetii benth. From Turkey. Rec. Nat. Prod. 2018, 12, 426–431. [CrossRef]

196. Delange, D.M.; Rico, C.L.M.; Canavaciolo, V.G.; Leyes, E.A.R.; Perez, R.S. Volatile constituents from leaves of endemic Scutellaria Havananesis jaq. in Cuba. J. Essent. Oil Bear. Plants 2013, 16, 368–371. [CrossRef]

197. Yilmaz, G.; Iek, M.; Demirci, B.; Baser, K.H.C. Essential oil compositions of subspecies of Scutellaria Brevibracteata stauf from Turkey. J. Essent. Oil Res. 2019, 31, 255–262. [CrossRef]

198. Dimaki, V.D.; Iatrou, G.; Lamari, F.N. Effect of acidic and enzymatic pretreatment on the analysis of mountain tea (sideritis spp.) volatiles via distillation and ultrasound-assisted extraction. J. Chromatogr. A 2017, 1524, 290–297. [CrossRef]

199. Kirimer, N.; Tabanca, N.; Tumen, G.; Duman, H.; Baser, K.H.C. Composition of the essential oils of four endemic sideritis species from Turkey. Flavour Frag. J. 1999, 14, 421–425. [CrossRef]

200. Goren, A.C.; Piozzi, F.; Akcicek, E.; Kilic, T.; Carikci, S.; Mozioglu, E.; Setzer, W.N. Essential oil composition of twenty-two stalkys species (mountain tea) and their biological activities. Phytochem. Lett. 2011, 4, 448–453. [CrossRef]

201. Kremer, D.; Bolaric, S.; Ballian, D.; Bogunic, F.; Stesevic, D.; Karlovic, K.; Kosalec, I.; Vokurka, A.; Rodriguez, J.V.; Randic, M.; et al. Morphological, genetic and phytochemical variation of the endemic Teucrium arduini L. (lamiaceae). Phytochemistry 2015, 116, 111–119. [CrossRef]

202. Blazquez, M.A.; Perez, I.; Boira, H. Essential oil analysis of Teucrium Libanitis and t-turvedanum by gc and gc-ms. Flavour Frag. J. 2003, 18, 497–501. [CrossRef]

203. Brophy, J.J.; Goldsack, R.J.; Forster, P.I. The leaf essential oils of Viticicrenna Queenslandica (lamiaceae). J. Essent. Oil Res. 2008, 20, 403–404. [CrossRef]

204. Konyalioglu, S.; Ozturk, B.; Meral, G.E. Comparison of chemical compositions and antioxidant activities of the essential oils of two Ziziphora Taxis from Anatolia. Pharm. Biol. 2006, 44, 121–126. [CrossRef]

205. Chaverri, C.; Ciccio, J.F.; Diaz, C. Chemical composition of Aiovea Costaricensis (lauraceae) essential oils from Costa Rica and their cytotoxic activity on cell lines. J. Essent. Oil Res. 2010, 22, 524–529. [CrossRef]

206. Salleh, W.; Ahmad, F. Antioxidant and anticholinesterase activities of essential oil of Alseodaphne Peduncularis meisn. Turk. J. Pharm. Sci. 2016, 13, 347–350. [CrossRef]

207. Luz, A.I.R.; da Silva, J.D.; Zogbhi, M.D.B.; Andrade, E.H.A.; Maia, J.G.S. Essential oil from Aniba Riparia (nees) mez. J. Essent. Oil Res. 2002, 14, 218–219. [CrossRef]

208. Salleh, W.; Ahmad, F.; Khong, H.Y.; Zulkifi, R.M. Comparative study of the essential oils of three beilschmiedia species and their biological activities. Int. J. Food Sci. Technol. 2016, 51, 240–249. [CrossRef]

209. Brophy, J.J.; Goldsack, R.J.; Forster, P.I. The essential oils of some australian Cassytha Species (lauraceae). J. Essent. Oil Res. 2009, 21, 543–546. [CrossRef]

210. Ahmed, A.; Choudhary, M.I.; Farooq, A.; Demirci, B.; Demirci, F.; Baser, K.H.C. Essential oil constituents of the spice Cinnamomum Tamala (ham.) nees & eberm. Flavour Frag. J. 2000, 15, 388–390. [CrossRef]

211. Son, L.C.; Dai, D.N.; Thang, T.D.; Huyen, D.D.; Oguwande, I.A. Analysis of the essential oils from five vietnamese litson species (lauraceae). J. Essent. Oil Bear. Plants 2014, 17, 960–971. [CrossRef]

212. Danielli, L.J.; Pippi, B.; Soares, K.D.; Duarte, J.A.; Maciel, A.J.; Machado, M.M.; Oliveira, L.F.S.; Bordignon, S.A.L.; Fuentefrica, A.M.; Apel, M.A. Chemosensitization of filamentous fungi to antifungal agents using Nectandra Rol. ex rotb. species essential oils. Ind. Crop Prod. 2017, 102, 7–15. [CrossRef]

213. John, A.J.; Karunakaran, V.P.; George, V. Chemical composition and antibacterial activity of leaf oil of Neolitsea foliosa (nees) gamble var. caesia (meissner) gamble. J. Essent. Oil Res. 2007, 19, 498–500. [CrossRef]

214. Barbosa, J.M.; Cunha, R.M.; Dias, C.S.; Athayde, P.F.; Silva, M.S.; Da-Cunha, E.V.L.; Machado, M.I.L.; Craveiro, A.A.; Medeiros, I.A. Gc-ms analysis and cardiovascuclar activity of the essential oil of Ocotea Duciei. J. Pharmacogn. 2008, 18, 37–41.
217. Yamaguchi, K.K.D.; Alcantara, J.M.; Lima, E.S.; da Veiga, V.F. Chemical composition and platelet aggregation activity of essential oils of two species of the Genus Ocotea (laureaceae). J. Essent. Oil Bear. Plants 2013, 16, 518–523. [CrossRef]

218. Ogunbinu, A.O.; Ogunwande, I.A.; Flamini, G.; Cioni, P.L. Volatile compounds of Persea Americana mill from Nigeria. J. Essent. Oil Bear. Plants 2007, 10, 133–138. [CrossRef]

219. Lopez, M.L.; Zunino, M.P.; Zygadlo, J.A.; Lopez, A.G.; Lucini, E.I.; Facillaci, S.M. Aromatic plants of yungas. Part ii. Chemical composition of the essential oil of Phoebe Porphyria (griseb.) mez. (laureaceae). J. Essent. Oil Res. 2004, 16, 129–130. [CrossRef]

220. Miyazawa, M.; Nakashima, Y.; Nakahashi, H.; Hara, N.; Nakagawa, H.; Usami, A.; Chavasiri, W. Volatile compounds with characteristic odor of essential oil from Magnolia Obovata leaves by hydrodistillation and solvent-assisted flavor evaporation. J. Oleo Sci. 2015, 64, 999–1007. [CrossRef]

221. Lawal, O.A.; Ogunwande, I.A.; Salvador, A.F.; Sanni, A.A.; Opoku, A.R. Pachira Glabra Pasq. essential oil: Chemical constituents, antimicrobial and insecticidal activities. J. Oleo Sci. 2014, 63, 629–635. [CrossRef]

222. Mevy, J.P.; Bessiere, J.M.; Rabier, J.; Legault, J.; Masse, D.; Pichette, A. Aromas from Quebec. Vi. J. Essent. Oil Res. 2004, 16, 273–278. [CrossRef]

223. Bignell, C.M.; Dunlop, P.J.; Brophy, J.J.; Jackson, J.F. Volatile leaf oils of some queensland and northern Australian species of the Genus eucalyptus. (series ii). Part i. Subgenus symphyomyrtus, section adnataria: (a) series oliganthae, (b) series ochrophloiae, (c) series moluccanae, (d) series polyanthemae, (e) series paniculatae, (f) series melliodorae and (g) series porantheroideae. Flavour Frag. J. 1997, 12, 19–27.

224. Rahman, M.S.; Ahad, A.; Saha, S.K.; Hong, J.; Kim, K.H. Antibacterial and phytochemical properties of Aphnanamis polystachya essential oil. Anal. Sci. Technol. 2017, 30, 113–121.

225. Lago, J.H.G.; de Avila, P.; de Aquino, E.M.; Moreno, P.R.H.; Ohara, M.T.; Limberger, R.P.; Apel, M.A.; Henriques, A.T. Volatile leaf oils from leaves and stem barks of Cedrela molle (meliaceae): Chemical composition and antibacterial activities. Flavour Frag. J. 2004, 19, 448–451. [CrossRef]

226. Ribeiro, W.H.F.; Arriaga, A.M.C.; Andrade-Neto, M.; Vasconcelos, J.N.; Santiago, G.M.P.; Nascimento, R.F. Composition of the essential oil of Guarea macrophylla var. rubra. J. Essent. Oil Res. 2007, 19, 30, 319–329. [CrossRef]

227. Sabulal, B.; Kurup, R.; Sumitha, B.; George, V. Chemical composition of the leaf oils of Myristica malabarica lam. and Gymnacranthera canaria (king) warb. J. Essent. Oil Res. 2007, 19, 323–325. [CrossRef]

228. Salleh, W.; Anuar, M.Z.A.; Khamis, S.; Nafiah, M.A.; Sul’ain, M.D. Chemical investigation and biological activities of the essential oil of Kaenua kunstleri warb. from Malaysia. Nat. Prod. Res. 2019. [CrossRef]

229. Limberger, R.P.; Sobral, M.E.G.; Zuanazzi, J.A.S.; Moreno, P.R.H.; Schapoval, E.E.S.; Henriques, A.T. Biological activities and essential oil composition of leaves of Blepharocalyx salicifolius. Pharm. Biol. 2001, 39, 308–311. [CrossRef]

230. Bignell, C.M.; Dunlop, P.J.; Brophy, J.J.; Jackson, J.F. Volatile leaf oils of some queensland and northern Australian species of the Genus eucalyptus. (series ii). Part i. Subgenus symphyomyrtus, section adnataria: (a) series oliganthae, (b) series ochrophloiae, (c) series moluccanae, (d) series polyanthemae, (e) series paniculatae, (f) series melliodorae and (g) series porantheroideae. Flavour Frag. J. 1997, 12, 19–27.

231. Medeiros, J.R.; Medeiros, N.; Medeiros, H.; Davin, L.B.; Lewis, N.G. Composition of the bioactive essential oils from the leaves of Eugenia stipitata mcvaugh ssp sororia from the Azores. J. Essent. Oil Res. 2004, 16, 273–278. [CrossRef]

232. St-Gelais, A.; Roger, B.; Alsarraf, J.; Legault, J.; Masse, D.; Pichette, A. Aromas from Quebec. Vi. J. Essent. Oil Res. 2004, 16, 273–278. [CrossRef]

233. Fernandez, X.; Loiseau, A.M.; Poulain, S.; Lizzani-Cuvelier, L.; Monnier, Y. Chemical composition of the essential oil of Phoebe Porphyria (griseb.) mez. (laureaceae). J. Essent. Oil Res. 2004, 16, 129–130. [CrossRef]

234. Bignell, C.M.; Dunlop, P.J.; Brophy, J.J.; Jackson, J.F. Volatile leaf oils of some queensland and northern Australian species of the Genus eucalyptus. (series ii). Part i. Subgenus symphyomyrtus, section adnataria: (a) series oliganthae, (b) series ochrophloiae, (c) series moluccanae, (d) series polyanthemae, (e) series paniculatae, (f) series melliodorae and (g) series porantheroideae. Flavour Frag. J. 1997, 12, 19–27.

235. Medeiros, J.R.; Medeiros, N.; Medeiros, H.; Davin, L.B.; Lewis, N.G. Composition of the bioactive essential oils from the leaves of Eugenia stipitata mcvaugh ssp sororia from the Azores. J. Essent. Oil Res. 2004, 16, 273–278. [CrossRef]

236. Hnawia, E.; Brophy, J.J.; Craven, L.A.; Lebouvier, N.; Cabalion, P.; Nour, M. An examination of the leaf essential oils of the Endemic melaleuca (myrtaceae) species of New Caledonia. J. Essent. Oil Res. 2012, 24, 273–278. [CrossRef]
237. Zoghbi, M.D.; Andrade, E.H.A.; da Silva, M.H.L.; Carreira, L.M.M.; Maia, J.G.S. Essential oils from three *myrica* species. Flavour Frag. J. 2003, 18, 421–424. [CrossRef]
238. Demo, M.S.; Oliva, M.M.; Zunino, M.R.; Lopez, M.L.; Zygdallo, J.A. Aromatic plants from Yungas. Part iv: Composition and antimicrobial activity of *myrcianthes* pseudo-mato essential oil. Pharm. Biol. 2002, 40, 481–484. [CrossRef]
239. El Ghallab, Y.; Al Jahid, A.; Eddine, J.J.; Said, A.A.H.; Zarayby, L.; Derfoufi, S. Chemical composition of the essential oil of *Calycorectes sellowianus*. Pharmacol. Biol. 2010, 48, 433–438. [CrossRef]
240. Southwell, I.A.; Russell, M.F.; Smith, R.L.; Vinnicombe, A. Aromatic plants from Yungas. Part iv: Volatile components of *Abies nephrolepis* and *Phytochemical investigation and comparison of the scavenging activity of essential oil, extracts and eugenol. Adv. Tradit. Med. 2020, 2019, 153–158. [CrossRef]
241. Apel, M.A.; Sobral, M.; Zuanazzi, J.A.; Henriques, A.T. Essential oil composition of four *pinus* species (pinaceae). Flavour Frag. J. 2006, 21, 565–567. [CrossRef]
242. Da Silva, J.D.; Luz, A.I.R.; da Silva, M.H.L.; Andrade, E.H.A.; Zoghbi, M.D.; Maia, J.G.S. Essential oils of the leaves and stems of four *psidium* spp. Flavour Frag. J. 2003, 18, 240–243. [CrossRef]
243. El Ghallab, Y.; Al Jahid, A.; Eddine, J.J.; Said, A.A.H.; Zarayby, L.; Derfoufi, S. Syzygium aromaticum L.: Phytochemical investigation and comparison of the scavenging activity of essential oil, extracts and eugenol. Adv. Tradit. Med. 2020, 2019, 153–158. [CrossRef]
244. Huong, L.T.; Hung, N.V.; Chac, L.D.; Dai, D.N.; Ogunwande, I.A. Essential oils from *Syzygium grande* (white) wulp. and *Syzygium sterophyllum* merr. et perry. J. Essent. Oil Bear. Plants 2017, 20, 1620–1626. [CrossRef]
245. Brophy, J.J.; Goldsack, R.J.; Forster, P.I. The essential oils of the australasian species of *uromyrtus* (myrtaceae). Flavour Frag. J. 1996, 11, 133–138. [CrossRef]
246. Rustaiyan, A.; Khalilzadeh, M.A.; Esliami, B.; Masoudi, S.; Tajbakhsh, M. Volatile constituents of *Meristotropis xanthioides* vassilez. and *Lotus michauxianus* ser. from Iran. J. Essent. Oil Res. 2006, 18, 631–632. [CrossRef]
247. Dai, D.N.; Thang, T.D.; Thin, D.B.; Ogunwande, I.A. Chemical composition of the leaf oil of *acteaphila excelsa* from Vietnam. Nat. Prod. Commun. 2014, 9, 1359–1360. [CrossRef]
248. Yu, E.J.; Kim, T.H.; Kim, K.H.; Lee, H.J. Characterization of aroma-active compounds of *Abies nephrlepis* (khiang fır) needles using aroma extract dilution analysis. Flavour Frag. J. 2004, 19, 74–79. [CrossRef]
249. Hmamouchi, M.; Hamamouchi, J.; Zouhdi, M.; Bessiere, J.M. Chemical and antimicrobial properties of essential oils of five Moroccan *pinaceae*. J. Essent. Oil Res. 2001, 13, 298–302. [CrossRef]
250. Tsitsimpikou, C.; Petakis, P.V.; Ortiz, A.; Harvala, C.; Roussis, V. Volatile needle terpenoids of six *pinus* species. J. Essent. Oil Res. 2001, 13, 174–178. [CrossRef]
251. Jeon, J.H.; Lee, H.S. Volatile components of essential oils extracted from *pinus* species. J. Essent. Oil Bear. Plants 2012, 15, 750–754. [CrossRef]
252. Yener, H.O.; Saygideger, S.D.; Sarikurkcu, C.; Yumrutas, O. Evaluation of antioxidant activities of essential oils and methanol extracts of *pinus* species. J. Essent. Oil Bear. Plants 2014, 17, 295–302. [CrossRef]
253. Facundo, V.A.; de Morais, S.M. Essential oil of *Piper tuberculatum* var. *Tuberculatum pip* (micq.) cdc leaves. J. Essent. Oil Res. 2005, 17, 304–305. [CrossRef]
254. Jirovetz, L.; Buchbauer, G.; Ngassoum, M.B.; Geissler, M. Aroma compound analysis of *Piper nigrum* and *piper guineense* essential oils from Cameroon using solid-phase microextraction-gas chromatography, solid-phase microextraction-gas chromatography-mass spectrometry and olfactometry. J. Chromatogr. A 2002, 976, 265–275. [CrossRef]
255. Menon, A.N.; Padmakumari, K.P.; Jayalekshmy, A.; Gopalakrishnan, M.; Narayanan, C.S. Essential oil composition of four popular Indian cultivars of black pepper (*Piper nigrum* L.). J. Essent. Oil Res. 2000, 12, 431–434. [CrossRef]
256. Sirat, H.M.; Thai, O.B.; Ahmad, F. Chemical composition of the essential oil of *Piper maingayi* hk. F. J. Essent. Oil Res. 2010, 22, 323–324. [CrossRef]
257. Moraes, M.S.; Machado, S.R.; Marques, M.O.M. Essential oil of the *Polomorphe petluta* (L.) miq. J. Essent. Oil Res. 2004, 16, 15–16. [CrossRef]
258. Zeng, Z.; Meng, C.Y.; Ye, X.N.; Zeng, Z. Analysis of volatile components of *adenosma Indianum* (lour.) merr. by steam distillation and headspace solid-phase microextraction. J. Chem. 2013, 2013, 1–7. [CrossRef]
259. Martins, A.P.; Salgueiro, L.R.; Cavaleiro, C.; da Cunha, A.P.; Tomi, F.; Casanova, J. Chemical composition of the oil of *Afrocarpus manni*, an endemic species from s.tome e principe. *J. Essent. Oil Res.* **2001**, *13*, 431–433. [CrossRef]

260. Cavalli, J.F.; Tomi, F.; Bernardini, A.F.; Casanova, J. Composition and chemical variability of the bark oil of *Cedrelopsis grevei* h. baillon from Madagascar. *Flavour Frag. J.* **2003**, *18*, 532–538. [CrossRef]

261. Navaei, M.N.; Mirza, M. A comparative study of the essential oils of *Agrimonia eupatoria* both cultivated and wild growing conditions in Iran. *J. Essent. Oil Bear. Plants* **2009**, *12*, 369–373. [CrossRef]

262. Ghazghazi, H.; Miguel, M.G.; Veslati, M.; Hasnaoui, B.; Sebei, H.; Barroso, J.G.; Pedro, L.G.; Figueiredo, A.C. Chemical variability of the essential oils from *Rosa canina* L. and *Rosa sempervirens* L. Flowers collected at Tunisia. *J. Essent. Oil Res.* **2012**, *24*, 475–480. [CrossRef]

263. Tava, A.; Biazzi, E.; Ronga, D.; Avaro, P. Identification of the volatile components of *Galium verum* L. and *Cruciata lewipes* opiz from the western Italian Alps. *Molecules* **2020**, *25*, 11. [CrossRef] [PubMed]

264. Rao, H.J.Z.; Lai, P.X.; Gao, Y. Chemical composition, antibacterial activity, and synergistic effects with conventional antibiotics and nitric oxide production inhibitory activity of essential oil from *Geophila repens* (L.) imjohnst. *Molecules* **2017**, *22*, 13.

265. Pant, P.; Sut, S.; Castagliuolo, I.; Gandin, V.; Maggi, F.; Gyawali, R.; Stefano, D. Sesquiterpenes rich essential oil from nepalese bael tree (*Aegle marmelos* (L.) correa) as potential antiproliferative agent. *Fitoterapia* **2019**, *138*, 6. [CrossRef] [PubMed]

266. Pino, J.A.; Rosado, A.; Bello, A.; Urquiola, A.; Garcia, S. Essential oil of *Amrys dimifera* L. from Cuba. *J. Essent. Oil Res.* **2000**, *12*, 39–40. [CrossRef]

267. Pang, X.; Almaz, B.; Qi, X.J.; Wang, Y.; Feng, Y.X.; Geng, Z.F.; Xi, C.; Du, S.S. Bioactivity of essential oil from *Atalantia buxifolia* leaves and its major sesquiterpenes against three stored-product insects. *J. Essent. Oil Bear. Plants* **2020**, *23*, 38–50. [CrossRef]

268. Padalia, R.C.; Verma, R.S.; Chauhan, A. Compositional variations in volatile constituents of *Boeninghausenia albiflora* reichb. from western Himalaya. *Nat. Acad. Sci. Lett.* **2013**, *36*, 635–640. [CrossRef]

269. Brophy, J.J.; Goldsack, R.J.; Forster, P.I. The leaf oils of the australian species of citrus (*rutaceae*). *J. Essent. Oil Res.* **2001**, *13*, 264–268. [CrossRef]

270. Supudompol, B. Composition and anti-mycobacterial activity of the essential oil of *Feroniella lucida* (scheff.) swing. *J. Essent. Oil Res.* **2009**, *21*, 561–562. [CrossRef]

271. Brophy, J.J.; Goldsack, R.J.; Forster, P.I. The leaf oils of the australian species of *flindersia* (*rutaceae*). *J. Essent. Oil Res.* **2005**, *17*, 388–395. [CrossRef]

272. Azadi, B.; Khaef, S.; Ziarati, P. Chemical composition of *Haplophyllum villosum* (m. B.) g. don essential oil. *J. Essent. Oil Bear. Plants* **2014**, *17*, 1161–1164. [CrossRef]

273. Brophy, J.J.; Goldsack, R.J.; Forster, P.I. The leaf oils of the australian species of *medicosma* (*rutaceae*). *J. Essent. Oil Res.* **2004**, *16*, 161–166. [CrossRef]

274. Brophy, J.J.; Goldsack, R.J.; Forster, P.I. Composition of the leaf oils of the australian species of *euodia* and *melicope* (*rutaceae*). *J. Essent. Oil Res.* **2004**, *16*, 286–293. [CrossRef]

275. Neta, M.C.S.; Vittorazzi, C.; Guimaraes, A.C.; Martins, J.D.L.; Franz, M.; Endringer, D.C.; Scherer, R. Effects of beta-caryophyllene and *Murraya paniculata* essential oil in the murine hepatoma cells and in the bacteria and fungi 24-h time-kill curve studies. *Pharm. Biol.* **2017**, *55*, 190–197. [CrossRef]

276. Padmakumari, K.P. Volatile constituents from the leaves and flowers of *Murraya koenigii* (linn.) spreng. *J. Essent. Oil Bear. Plants* **2009**, *12*, 722–727. [CrossRef]

277. Pavithra, P.S.; Mehta, A.; Verma, R.S. Induction of apoptosis by essential oil from p. *Missionis* in skin epidermoid cancer cells. *Phytomedicine* **2018**, *50*, 184–195.

278. Cabral, F.D.; Alves, C.C.F.; Cabral, R.S.C.; Willrich, G.B.; Crotti, A.E.M.; Miranda, M.L.D. Chemical constituents of essential oils extracted from the leaves and flowers of *Spiranthera odoratissima* a. st. hil. (*rutaceae*). *Rec. Nat. Prod.* **2019**, *13*, 172–175. [CrossRef]

279. Brophy, J.J.; Goldsack, R.J.; Forster, P.I.; Hutton, I. Composition of the leaf oils of the australian and lord howe island species of *zanthoxyllum* (*rutaceae*). *J. Essent. Oil Res.* **2000**, *12*, 285–291. [CrossRef]

280. Song, X.H.; Li, H.; Li, C.R.; Xu, J.W.; Hu, D.M. Effects of vocs from leaves of *Acer truncatum* bunge and *Cedrus deodara* on human physiology and psychology. *Urban For. Urban Green.* **2016**, *19*, 29–34. [CrossRef]
281. Rehman, J.U.; Wang, M.; Yang, Y.P.; Liu, Y.B.; Li, B.; Qin, Y.; Wang, W.; Chittiboyina, A.G.; Khan, I.A. Toxicity of Kadsura coccinea (lem.) a. c. Sm. Essential oil to the bed bug, Cimex lectularius L. (hemiptera: Cimicidae). *Insects* **2019**, *10*, 11. [CrossRef]

282. Garg, S.C.; Dengre, S.L. Composition of the essential oil from the leaves of *Buddleia asiatica* lour. *Flavour Frag. J.* **1992**, *7*, 125–127. [CrossRef]

283. Fonseca, A.M.; Pessoa, O.D.L.; Lemos, T.L.G.; Nascimento, R.F. Constituents of the essential oil of *capribia biflora* from northeast Brazil. *J. Essent. Oil Res.* **2006**, *18*, 158–159. [CrossRef]

284. Osorio, A.M.B.; Silva, T.M.; Duarte, L.P.; Ferraz, V.P.; Pereira, M.T.; Mercadante-Simoes, M.O.; Evangelista, F.C.G.; Sabino, A.P.; Alcantara, A.F.C. Essential oil from flowers of *solanum stipulaceum*; Composition, effects of gamma-radiation, and antileukemic activity. *J. Braz. Chem. Soc.* **2015**, *26*, 2233–2240.

285. Pino, J.A.; Marbot, R.; Fuentes, V. Essential oil of *Aloysia virgata* juss. from Cuba. *J. Essent. Oil Res.* **2004**, *16*, 44–45. [CrossRef]

286. Sousa, E.O.; Rodrigues, F.F.G.; Coutinho, H.D.M.; Campos, A.R.; Lima, S.G.; Costa, J.G.M. Chemical composition and aminoglycosides synergistic effect of *Lantana montevidensis* brij. (verbenaceae) essential oil. *Rec. Nat. Prod.* **2011**, *5*, 60–64.

287. Randrianalijaona, J.A.; Ramanoeлина, P.A.R.; Rasaoarahona, J.R.E.; Gaydou, E.M. Seasonal and chemotype influences on the chemical composition of *Lantana camara* L. essential oils from Madagascar. *Anal. Chim. Acta* **2005**, *545*, 46–52. [CrossRef]

288. Vila, R.; Iglesias, J.; Canigueral, S.; Ciccio, J.F. Composition of the essential oil from leaves of *lippia myriocephala* from Costa Rica. *J. Essent. Oil Res.* **2004**, *16*, 177–179. [CrossRef]

289. Baez, D.; Pino, J.A.; Morales, D. Floral scent composition in *Petitia domingensis* jaqc. Analyzed by hs-spme. *J. Essent. Oil Bear. Plants* **2012**, *15*, 782–784. [CrossRef]

290. Eyob, S.; Appelgren, M.; Rohloff, J.; Tsegaye, A.; Messele, G. Traditional medicinal uses and essential oil composition of leaves and rhizomes of *korarima* (*Aframomum coronarium* (braun) p.C.M. Jansen) from southern Ethiopia. *S. Afr. J. Bot.* **2008**, *74*, 181–185. [CrossRef]

291. Ali, S.; Sotheeswaran, S.; Tuivawa, M.; Smith, R.M. Comparison of the composition of the essential oils of *alpinia* and *hedychium* species—Essential oils of fijian plants, part 1. *J. Essent. Oil Res.* **2002**, *14*, 409–411. [CrossRef]

292. Wong, K.C.; Lee, B.C.; Lam, N.F.; Ibrahim, P. Essential oils of the rhizomes of *Alpinia conchigera* griff. and *Alpinia latilabris* ridl. *Flavour Frag. J.* **2005**, *20*, 431–433. [CrossRef]

293. Huong, L.T.; Dai, D.N.; Thang, T.D.; Bach, T.T.; Ogunwande, I.A. The essential oils of the leaf, pseudostem root and fruit of *Alpinia matica* roxb. *J. Essent. Oil Bear. Plants* **2016**, *19*, 2049–2055. [CrossRef]

294. Huong, L.T.; Dai, D.N.; Thang, T.D.; Bach, T.T.; Ogunwande, I.A. Analysis of the volatile constituents of *alpinia pinnanensis*. *J. Essent. Oil Bear. Plants* **2017**, *20*, 264–271. [CrossRef]

295. Taiwo, A.O.; Bolanle, A.A. The leaf essential oil of costus afer ker-grawl from Nigeria. *Flavour Frag. J.* **2003**, *18*, 309–311. [CrossRef]

296. Raina, V.K.; Srivastava, S.K.; Jain, N.; Ahmad, A.; Syamasundar, K.V.; Aggarwal, K.K. Essential oil composition of *Curcuma longa* L. Cv. Roma from the plains of northern India. *Flavour Frag. J.* **2002**, *17*, 99–102. [CrossRef]

297. Wong, K.C.; Sivasothy, Y.; Boey, P.L.; Osman, H.; Sulaiman, B. Essential oils of *Ettlingera elatior* (jack) r. m. Smith and *Ettlingera littoralis* (koenig) giseke. *J. Essent. Oil Res.* **2010**, *22*, 461–466. [CrossRef]

298. Raj, G.; George, V.; Dan, M.; Sethuraman, M.G. Essential oil composition of *Globba schomburgkii* hook. F. and *Globba ophioglossa* wight. *J. Essent. Oil Res.* **2010**, *22*, 220–222. [CrossRef]

299. Dos Santos, B.C.B.; Barata, L.E.S.; Marques, F.A.; Baroni, A.C.M.; Karnos, B.A.C.; de Oliveira, P.R.; Guerrero, P.G. Composition of leaf and rhizome essential oils of *Hedychium coronarium* koen. from Brazil. *J. Essent. Oil Res.* **2010**, *22*, 305–306. [CrossRef]

300. Gevu, K.V.; Limag, H.R.P.; Neves, B.A.; Mello, E.O.; Taveirag, G.B.; Carvalho, L.P.; Carvalho, M.G.; Gomes, VM.; Melo, E.J.T.; Da Cunha, M. Chemical composition and anti-candida and anti-trypanosoma cruzi activities of essential oils from the rhizomes and leaves of Brazilian species of *renelma* l. *Fil. Rec. Nat. Prod.* **2019**, *13*, 268–280. [CrossRef]

301. Maia, J.G.S.; Andrade, E.H.A.; Carreira, L.M.M.; da Silva, M.H.L. Essential oil composition of *Renealmia alpinia* (rothb.) maas. *J. Essent. Oil Bear. Plants* **2007**, *10*, 10–14. [CrossRef]
302. Sabulal, B.; Dan, M.; Anil, J.J.; Kurup, R.; Pradeep, N.S.; Valsamma, R.K.; George, V. Caryophyllene-rich rhizome oil of *zingiber nimmonii* from south India: Chemical characterization and antimicrobial activity. *Phytochemistry* 2006, 67, 2469–2473. [CrossRef] [PubMed]

303. Barra, A. Factors affecting chemical variability of essential oils: A review of recent developments. *Nat. Prod. Commun.* 2009, 4, 1147–1154. [CrossRef] [PubMed]

304. Gad, H.A.; El-Ahmady, S.H.; Abou-Shoer, M.L.; Al-Azizi, M.M. Application of chemometrics in authentication of herbal medicines: A review. *Phytochem. Anal.* 2013, 24, 1–24. [CrossRef] [PubMed]

305. Mañé, M.E. *Plant Bioactive Molecules*; Cambridge Scholars Publishing: Newcastle upon Tyne, UK, 2018.

306. Soni, U.; Brar, S.; Gauttam, V.K. Effect of seasonal variation on secondary metabolites of medicinal Plants. *Int. J. Pharmacol. Sci. Res.* 2015, 6, 3654–3662.

307. Xavier, F.H.; Maciuk, A.; Morais, A.R.D.; Alencar, E.D.; Garcia, V.L.; do Egitto, E.S.T.; Vauthier, C. Development of a gas chromatography method for the analysis of copaiba oil. *J. Chromatogr. Sci.* 2017, 55, 969–978. [CrossRef]

308. Sousa, J.P.B.; Brancalion, A.P.S.; Souza, A.B.; Turatti, I.C.C.; Ambrosio, S.R.; Furtado, N.; Lopes, N.P.; Bastos, J.K. Validation of a gas chromatographic method to quantify sesquiterpenes in copaiba oils. *J. Pharm. Biomed. Anal.* 2011, 54, 653–659. [CrossRef]

309. Junor, G.A.O.; Porter, R.B.R.; Yee, T.H. Chemical composition of essential oils from the aerial parts of jamaican bursera lunanii spreng. *J. Essent. Oil Res.* 2010, 22, 602–605. [CrossRef]

310. Temel, M.; Tinnaz, A.B.; Ozturk, M.; Gunduz, O. Production and trade of medicinal and aromatic plants in the world and Turkey. *Ksu Tarim Ve Doga Dergisi-Ksu J. Agric. Nat.* 2018, 21, 198–214.

311. Klauke, A.L.; Racz, I.; Pradier, B.; Markert, A.; Zimmer, A.M.; Gertsch, J.; Zimmer, A. The cannabinoid cb(2) receptor-selective phytocannabinoid beta-caryophyllene exerts analgesic effects in mouse models of inflammatory and neuropathic pain. *Eur. Neuropsychopharmacol.* 2014, 24, 608–620. [CrossRef]

312. Chicca, A.; Caprioglio, D.; Minassi, A.; Petrucci, V.; Appendino, G.; Tagliatela-Scafati, O.; Gertsch, J. Functionalization of beta-caryophyllene generates novel polypharmacology in the endocannabinoid system. *ACS Chem. Biol.* 2014, 9, 1499–1507. [CrossRef]