ALKALOIDS
AS POTENTIAL FUNGISTATIC SUBSTANCES

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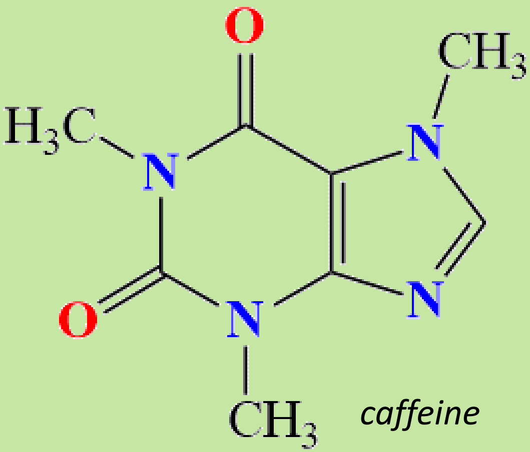
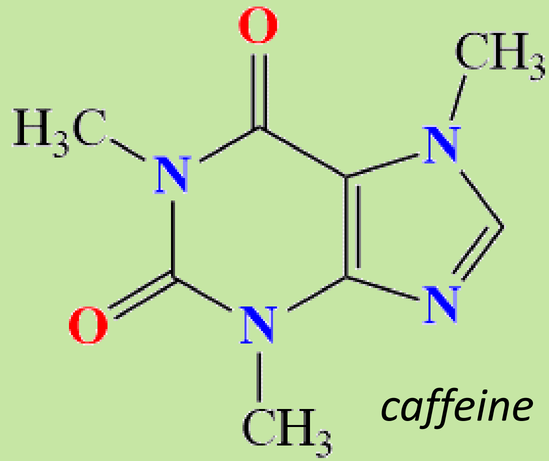
WHAT ARE AN ALKALOIDS?



caffeine

They are characterized by three key features:

- The nitrogen atom is usually present in a ring system
- The compounds are of natural origin
- The compounds manifests significant physiological effects on human and animal organisms



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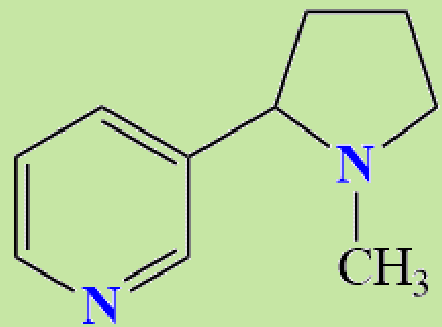
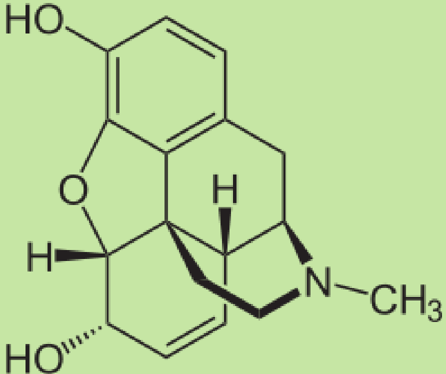
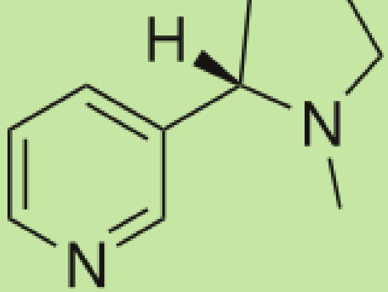


nicotine

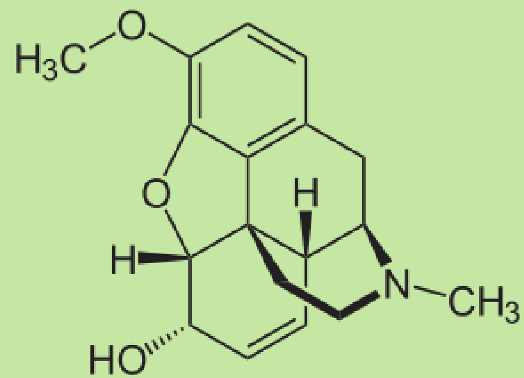
Examples of well-known alkaloids



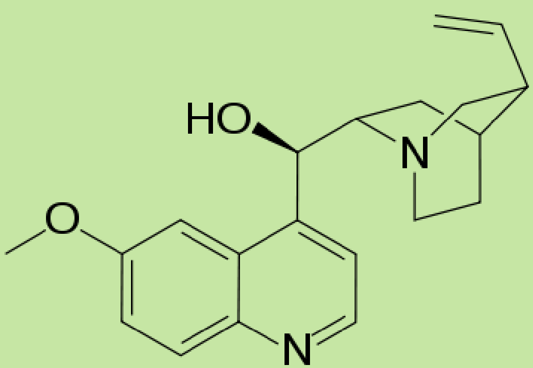
morphine



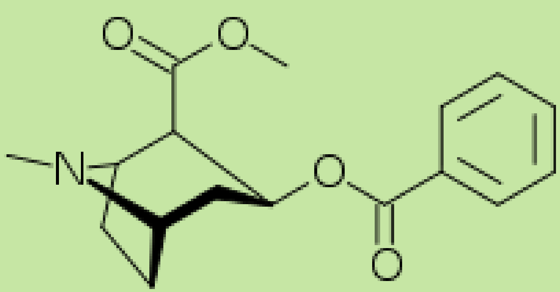
nicotine



codeine



quinine



cocaine

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REVIEW

Insecticidal and antifungal chemicals produced by plants: a review

**Isabelle Boulogne · Philippe Petit ·
Harry Ozier-Lafontaine · Lucienne Desfontaines ·
Gladys Loranger-Merciris**

Received: 17 February 2012 / Accepted: 29 February 2012 / Published online: 11 March 2012

Abstract Leaf-cutting ants of the *Attini* tribe are a major pest of agricultural and forestry productions in the New World. Economic losses caused by these ants were estimated at several million dollars per year. These ants need to live in symbiosis with a basidiomycete fungus. Due to their mutualistic interaction with the syr
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environment. Very few studies describe al
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insecticidal and fungicidal plant extracts. Th
a need of knowledge on phytochemicals
could be used as insecticides and fungic
review chemicals of plant origin and speci
cidal and fungicidal activities. We establish
and phytochemicals that could manage le
and also other insects, notably insects th
based agriculture. An exhaustive literature
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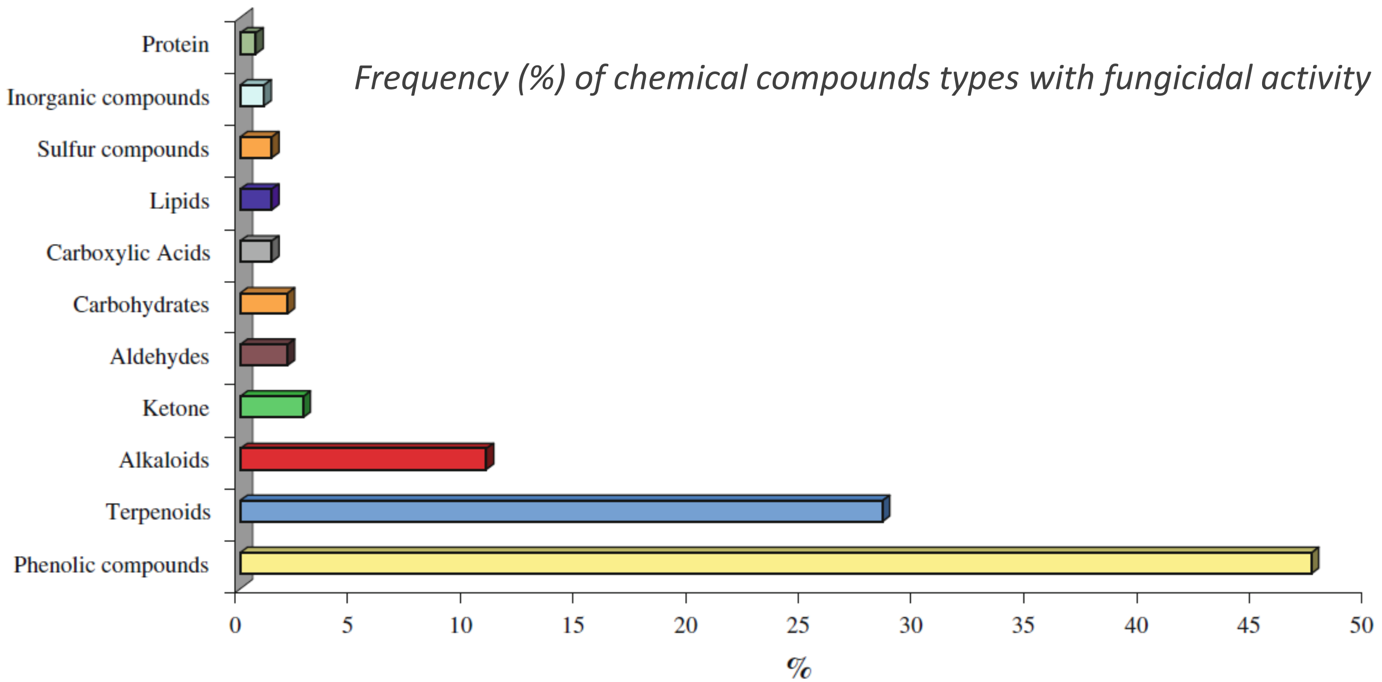
Nature is an almost infinite source of chemicals.



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caused by extensive use of synthetic chemical pesticides (Rattan 2010). Synthetic pesticides have been used since

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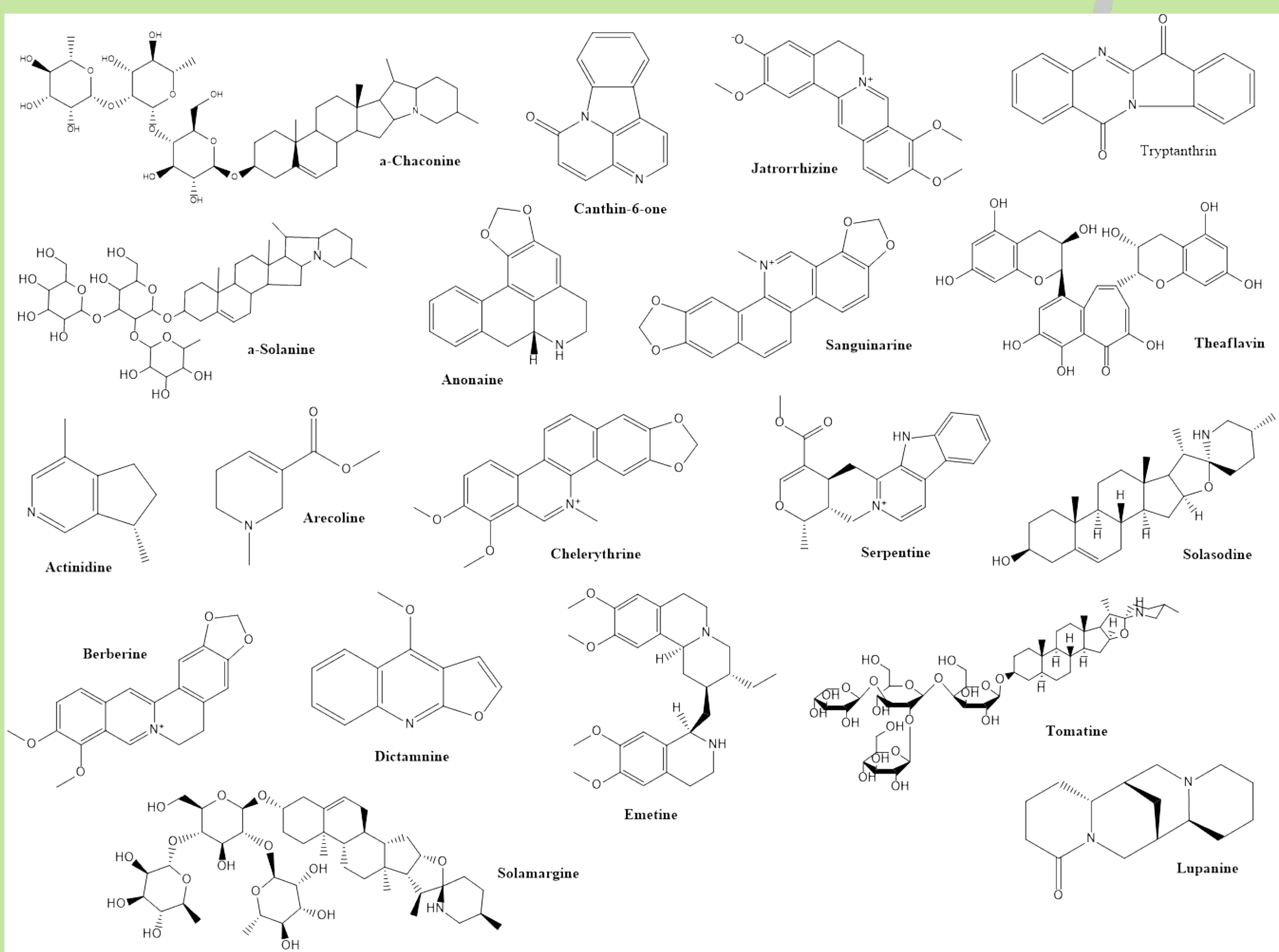
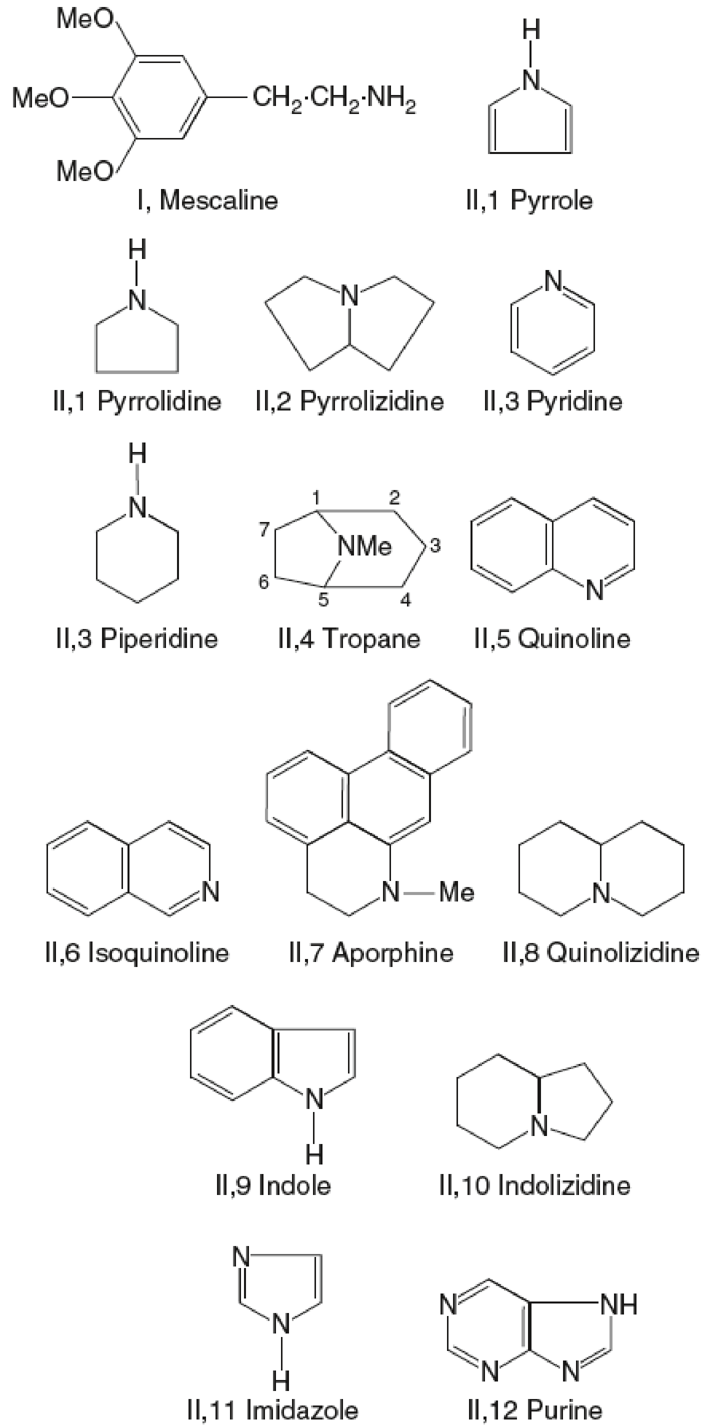
Examples of alkaloids with fungicidal activity

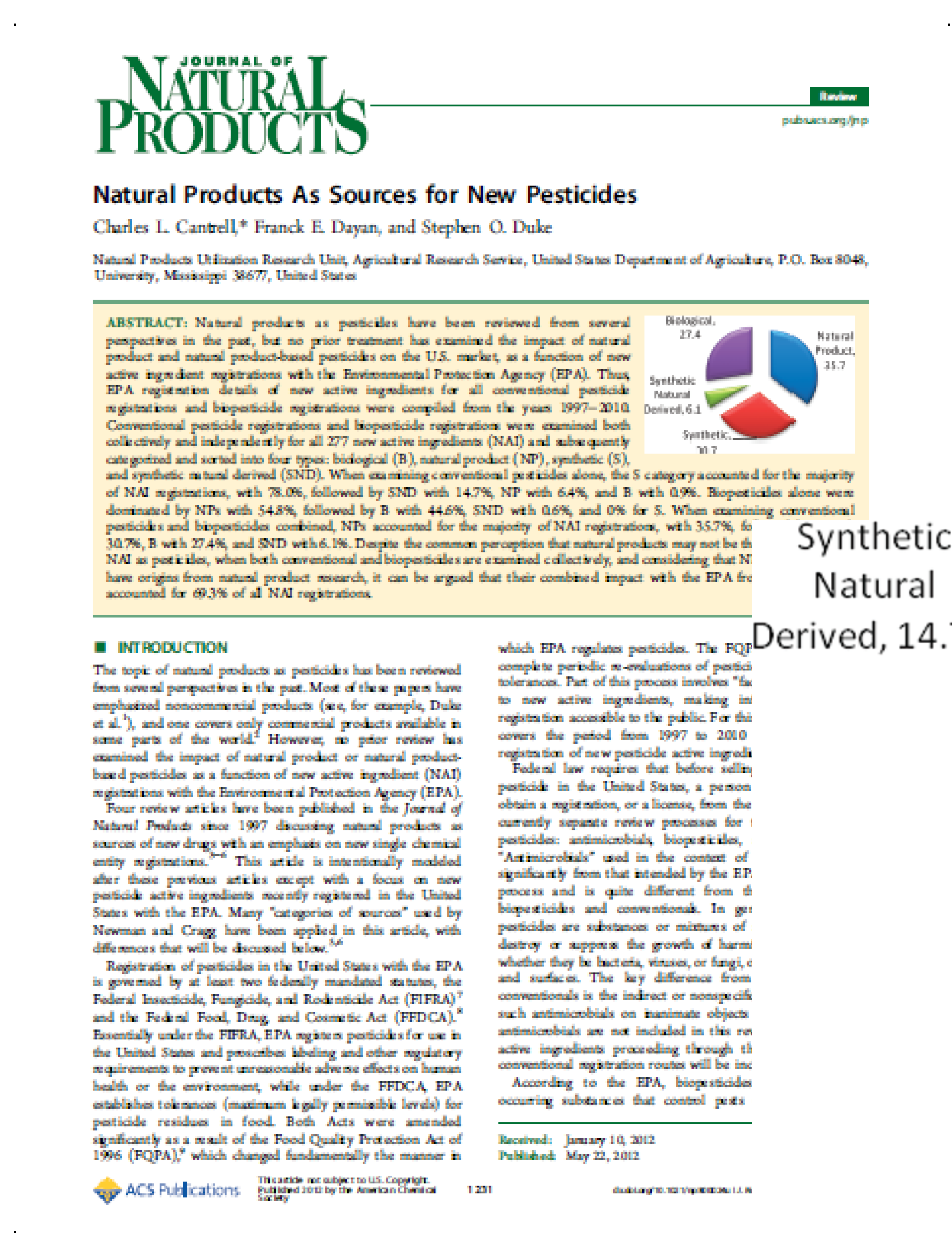
- Arecoline
- Berberastine
- Berberine
- Canthin-6-one
- Chelerythrine
- Dehydroglaucine
- Dictamnine
- Emetine
- Frangufoline
- Isoboldine
- Jatrorrhizine
- Liriodenine
- Lupanine
- Methoxybrassitin
- Reticuline
- Rubijervine
- Sanguinarine
- Serpentine
- Solamargine
- Solanine
- Solasodine
- Theaflavin
- Tomatine
- Tryptanthrin



THE SIMPLEST DIVISION OF ALKALOIDS

Because of the diversity in terms of chemical structure, origin and pharmacological activity can be many ways of classification.





JOURNAL OF NATURAL PRODUCTS

Review

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Natural Products As Sources for New Pesticides

Charles L. Cantrell,* Franck E. Dayan, and Stephen O. Duke

Natural Products Utilization Research Unit, Agricultural Research Service, United States Department of Agriculture, P.O. Box 8048, University, Mississippi 38677, United States

ABSTRACT: Natural products as pesticides have been reviewed from several perspectives in the past, but no prior treatment has examined the impact of natural product and natural product-based pesticides on the U.S. market, as a function of new active ingredient registrations with the Environmental Protection Agency (EPA). Thus, EPA registration details of new active ingredients for all conventional pesticide registrations and biopesticide registrations were compiled from the years 1997–2010. Conventional pesticide registrations and biopesticide registrations were examined both collectively and independently for all 277 new active ingredients (NAI) and subsequently categorized and sorted into four types: biological (B), natural product (NP), synthetic (S), and synthetic natural derived (SND). When examining conventional pesticides alone, the S category accounted for the majority of NAI registrations, with 78.0%, followed by SND with 14.7%, NP with 6.4%, and B with 0.9%. Biopesticides alone were dominated by NPs with 54.8%, followed by B with 44.6%, SND with 0.6%, and 0% for S. When examining conventional pesticides and biopesticides combined, NPs accounted for the majority of NAI registrations, with 35.7%, fo 30.7%, B with 27.4%, and SND with 6.1%. Despite the common perception that natural products may not be th NAI as pesticides, when both conventional and biopesticides are examined collectively, and considering that N have origins from natural product research, it can be argued that their combined impact with the EPA fro accounted for 69.3% of all NAI registrations.

Biological, 27.4
Natural Product, 35.7
Synthetic Natural Derived, 6.1
Synthetic, 30.7

INTRODUCTION

The topic of natural products as pesticides has been reviewed from several perspectives in the past. Most of these papers have emphasized noncommercial products (see, for example, Duke et al.[1]), and one covers only commercial products available in some parts of the world.[2] However, no prior review has examined the impact of natural product or natural product-based pesticides as a function of new active ingredient (NAI) registrations with the Environmental Protection Agency (EPA).

Four review articles have been published in the *Journal of Natural Products* since 1997 discussing natural products as sources of new drugs with an emphasis on new single chemical entity registrations.[3−6] This article is intentionally modeled after these previous articles except with a focus on new pesticide active ingredients recently registered in the United States with the EPA. Many "categories of sources" used by Newman and Cragg have been applied in this article, with differences that will be discussed below.[5,6]

Registration of pesticides in the United States with the EPA is governed by at least two federally mandated statutes, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)[7] and the Federal Food, Drug, and Cosmetic Act (FFDCA).[8] Essentially under the FIFRA, EPA registers pesticides for use in the United States and prescribes labeling and other regulatory requirements to prevent unreasonable adverse effects on human health or the environment, while under the FFDCA, EPA establishes tolerances (maximum legally permissible levels) for pesticide residues in food. Both Acts were amended significantly as a result of the Food Quality Protection Act of 1996 (FQPA),[9] which changed fundamentally the manner in which EPA regulates pesticides. The FQP complete periodic re-evaluations of pestic tolerances. Part of this process involves "fa to new active ingredients, making in registration accessible to the public. For thi covers the period from 1997 to 2010 registration of new pesticide active ingredi

Federal law requires that before sellin pesticide in the United States, a person obtain a registration, or a license, from the currently separate review processes for pesticides: antimicrobials, biopesticides, "Antimicrobials" used in the context of significantly from that intended by the EP process and is quite different from th biopesticides and conventionals. In ge pesticides are substances or mixtures of destroy or suppress the growth of harm whether they be bacteria, viruses, or fungi, and surfaces. The key difference from conventionals is the indirect or nonspecifi such antimicrobials on inanimate objects antimicrobials are not included in this re active ingredients proceeding through th conventional registration routes will be in

According to the EPA, biopesticides occurring substances that control pests

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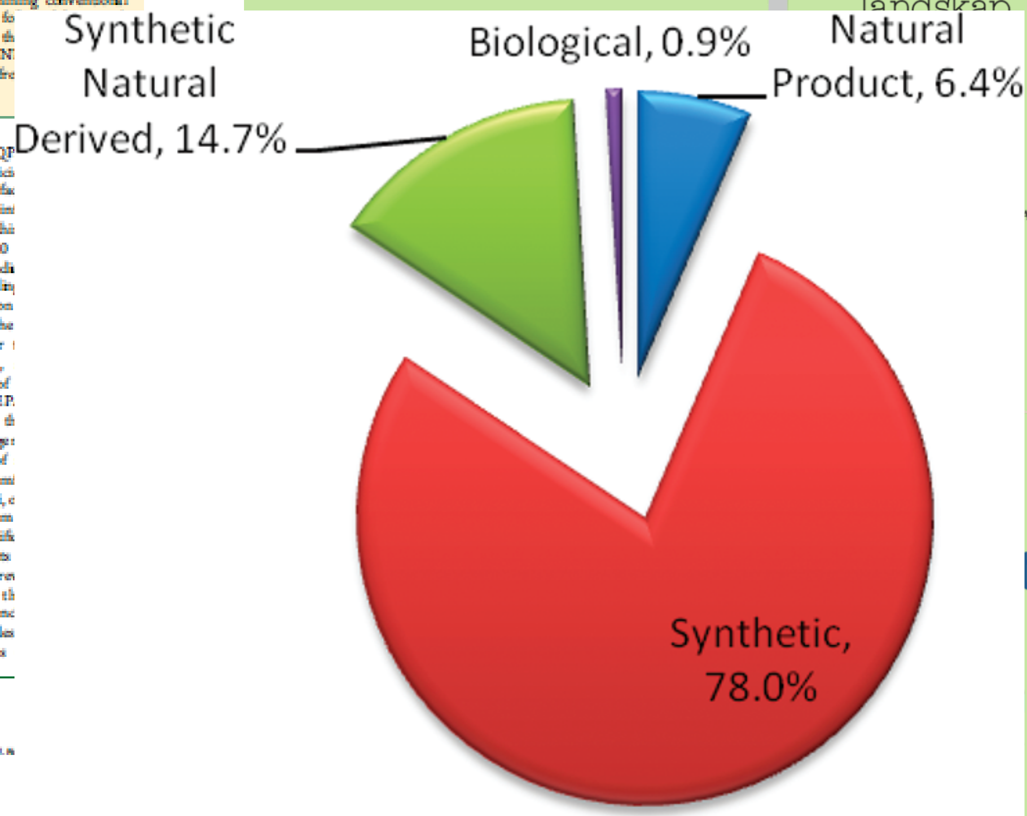
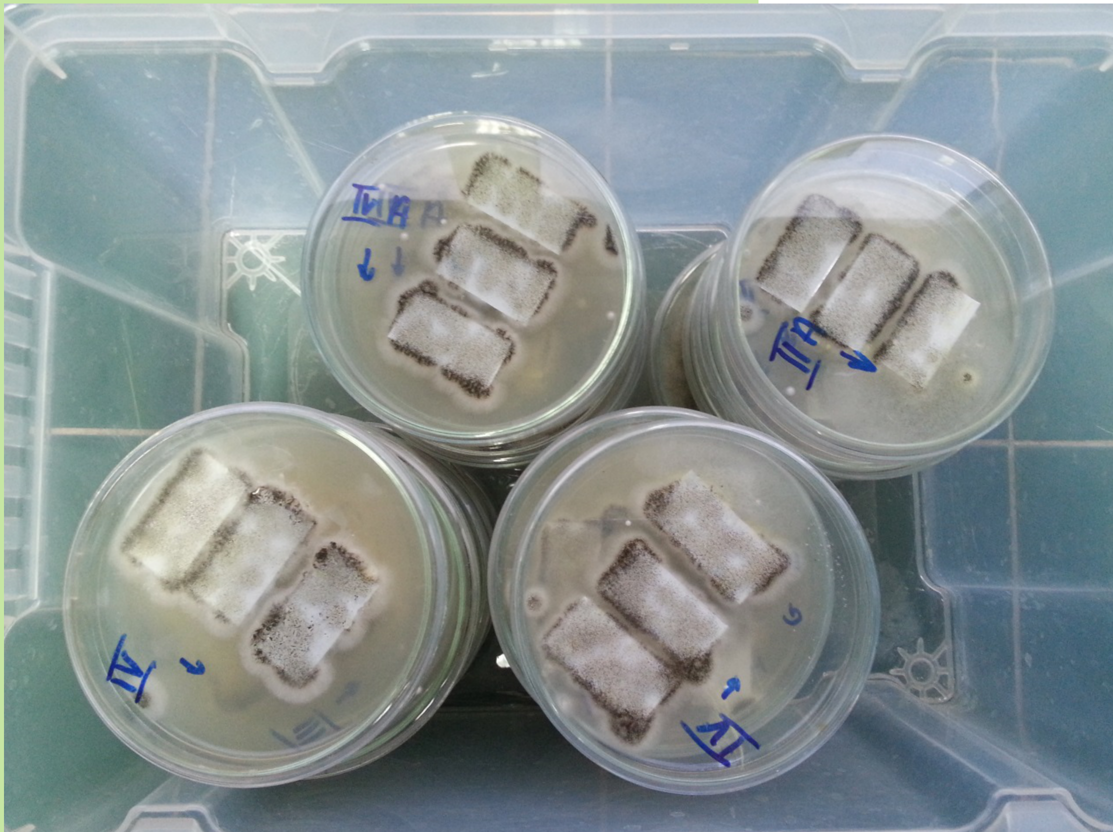
New active ingredient registrations for conventional pesticides from 1997 to 2010 organized by source.



TLC - Bioautography



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Review

Bioautography detection in thin-layer chromatography

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ARTICLE INFO

ABSTRACT

Bioautography is a microbial detection method hyphenated with planar chromatography techniques. It is based mainly on antimicrobial or antifungal properties of analyzed substances. The review discusses three versions of bioautography, i.e. contact, immersion and direct bioautography. The more concern is given to the last one. Many applications are quoted, not only for testing various groups of compounds, but also for investigating biochemical processes and factors influencing bacterial growth. Additionally, related methods, which can be included into direct bioautography, are discussed. The most promising among them seems to be TLC-bioluminescence screening.

gical screening methods
microbial activity (Fig. 1).
ocedure, which is applied
h the presence or absence
is a simple measurement
often, screening methods
methods. Moreover, they
not require sophisticated
ethods are based on the
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]. This detection method
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atography (TLC), high-
(HPTLC), overpressured-
r electrochromatography

(PEC). In this review, the name TLC-bioautography is used mostly in its wide-ranging meaning concerning any planar technique linked to bioautography. In so-called direct bioautography, i.e. bioautography hyphenated directly with thin-layer chromatography (TLC-DB), both separation and microbial detection are performed on the same TLC plate. Generally, the method measures antibacterial properties of analyzed substances, i.e. changes in bacterial growth. However, other mechanisms of action can be considered, e.g. disturbing vital cell processes as it takes place when bioautography is performed using luminescent bacteria, in so-called TLC-bioluminescence method [4,5]. Both TLC-DB and TLC-bioluminescence enable searching for biological active substances in complicated mixtures and matrices, and can be included into effect-directed analysis (EDA), a new approach in environmental and hazard management based on biological response [6,7].

2. Microbiological screening methods

2.1. Diffusion methods

Diffusion methods are frequently used in testing antimicrobial susceptibility of pure substances, preferably polar than non-polar

M. Choma).

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